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Predictability of International Stock Returns with Sum of the Parts and Equity Premiums under Regime Shifts

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By

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DEDICATION

To my beloved grandmother

and

To my parents

for their endless love, encouragement, and prayers for my success

and

for installing in me respect for education

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Abstract

This research consists of two essays. The first essay entitled" Stock Return Forecasting with Sum-of-the-Parts Methodology: Evidence from Around the World", examines forecasting ability of stock returns by employing the sum-of-the-parts (SOP) modeling technique introduced by Ferreira and Santa-Clara (2011).This approach decomposes return into three components of growth in price-earnings ratio, earnings growth, and dividend-price ratio. Each component is forecasted separately and fitted values are used in forecast model to predict stock return. We conduct a series of one-step ahead recursive forecasts for a wide range of developed and emerging markets over the period February 1995 through November 2014. Decomposed return components are forecasted separately using a list of financial variables and the fitted values from the best estimators are used according to out-of-sample performance. Our findings show that the SOP method with financial variables outperforms the historical sample mean for the majority of countries.

Second essay entitled," Equity Premium Predictability under Regime Shifts: International Evidence", utilizes the modified version of the dividend-price ratio that alleviates some econometric concerns in the literature regarding the non-stationary and persistent predictor when forecasting international equity premium across different regimes. We employ Markov switching technique to address the issue of non-linearity between the equity premium and the predictor. The results show different patterns of equity premium predictability over the regimes across countries by the modified ratio as predictor. In addition, transition probability analysis show the adverse effect of financial crisis on regime transition probabilities by increasing the probability of switching between regimes post-crisis 2007 implying higher risk perceived by investors as a result of uncertainty inherent in regime transitions.

Key words: Predictability, Stock returns, Sum-of-the-Parts, Equity Premium, Markov Switching Model, Transition Probability.

CHAPTER 1

Stock Return Forecasting with Sum-of-the-Parts Methodology: Evidence from Around the World

1. Introduction

Return predictability of stock markets is of considerable interest to the market participants, who try to set up trading strategies that exploit predictability to enhance profits and better market timing.[1]Although stock returns could be predictable, they would still contain a sizable unpredictable component, so that the best forecasting model can explain only a relatively small part of stock returns. Even small predictability signals economically significant return predictability (see Kandel and Stambaugh, 1996, Xu, 2004, Campbell and Thompson, 2008).Cochrane (2008) using joint distribution of dividend-price ratio and dividend growth regressions shows that returns are predictable, but not the dividend growth. Chen (2009) shows that the evidence of stock return predictability in the US associates with time period after World War II while before that it was dividend growth that was predictable by common valuation ratios as predictor. However, some empirical studies report evidence of structural breaks or instability in the return predictive regression models. For example, Goyal and Welch (2008) suggest that the coefficients of the predictive regression models are unstable as diagnosed by their poor out-of-sample predictions even in the presence of strong in-sample predictability. Cochrane (2008) argues that this is not evidence against predictability per se but only evidence of the difficulty in utilizing predictability with trading strategies. Many studies also examine stock returns predictability using financial and fundamental variables.[2]It is reasonable to conjecture that if financial variables convey information about aggregate stock market returns they should provide in some extent information for return components as well.

[1]Numerous studies find the evidence of return predictability including Fama and French (1988) and Campbell and Shiller (1988), and Cochran (2008, 2011).
[2] See, for example Jordan et.al (2014), Zhou and Ruland (2006), and Arnott and Asness (2003), Flint et.al (2010), Pontiff and Schall (1998), and among others.

Ferreira and Santa-Clara (2011) offer a new approach to predict stock market returns. They introduce the Sum-of-the-part (SOP) method and show that this method performs better than traditional model and historical average in predicting stock returns. Within sum-of-the-part framework, equity returns are decomposed into three parts consisting of growth rate of price–earnings ratio, growth rate of earnings, and dividend–price ratio. Then fitted value of each component is used to forecast stock market returns. They find the superior performance of the SOP technique for UK and Japan. McMillan and Wohar (2011) show that this method works well for other markets such as UK, US, Italy and Korea, although the evidence is not universal.

In this paper we examine whether conventional financial variables that have shown to have some extent predictive power for stock returns are able to predict return components as the sum-of-the-parts method for both in-sample and out-of-sample forecasting. In other word, our aim is to trace out how time path of three return components are influenced by various financial variables. There is ample evidence that aggregate stock market returns are predictable for in-sample forecasting using a variety of economic and financial variables; however, the predictive ability does not hold up in out-of-sample forecasting exercises. Portfolio management is one of the most important practical application in finance, and portfolio allocation requires an estimate of stock market expected returns that works with out-of-sample with high explanatory power. We find that the sum-of-the-Parts (SOP) method produces statistically and economically significant gains and performs better out-of-sample than the historical mean or predictive regression for the majority of countries examined. This superior performance of the SOP method could be mainly due to the low estimation error that comes from a return forecast equal to the sum of three earlier mentioned components. This research would shed light on the issues of out-of-sample predictability of the decomposed return components by using financial variables.

The current research contributes to the literature in the following ways. First, we consider a wide range of countries consisting of both developed and emerging markets, and have a comprehensive analysis of return components predictability. Park (2010) and Kellard et al. (2010) find that the common return predictors have different degree of predictability across countries and across times. Second, we incorporate financial variables into forecasting the return components as in the SOP method to better understand the predictive power of these variables and then compare the out-of-sample predictability performance. This research incorporates financial variables to improve forecasting ability of the aggregate returns by offering the alternative approach to forecast return components. It holds the benefit of low estimation error to forecast aggregate stock market returns through sum-of-the-parts method. This approach conveys superior information and significant economic benefits for investors using strategy based on this method in predicting the return components to better time the market in real time.

2. Literature Review

A large body of literature shows that stock market returns are predictable. Dividend-price ratio is among the most popular predictors of the stock returns and dividend growth. Many studies in the literature find the evidence in favor of the return predictability using dividend-price ratio. Among them Cochrane (2008) applies joint distribution of dividend-price ratio coefficients in return and dividend growth regressions and shows that returns are predictable and not the dividend growth. He also shows that return predictability increases with investment horizon. Chen (2009) shows that for the pre-World War II, the opposite predictability pattern characterizes the US stock market: returns are unpredictable while dividend growth is predictable by the dividend–price ratio if dividends are measured without reinvestment. However, for the post war period, he obtains results consistent with the Cochrane (2008)'s view, namely predictable stock returns and unpredictable dividend growth.

Koijen and Nieuwerburgh (2011) survey the literature on return and dividend growth predictability. They find that predictability pattern of the stock returns and dividend growth is sensitive to the sample time period. They show that stock returns are less and dividend growth are more predictable over the full sample (1927-2009). However, when they consider the period post-World War II, these results reverse with no dividend growth and stronger return predictability, using simple predictability regressions with the dividend-price ratio as predictor. They also find return predictability is modest, but expected returns are persistent. As a result, about 90 per cent of the variation in price-dividend ratios is due to variation in expected returns.

Engsted and Pedersen (2010) use long term data of aggregate stock prices and dividends for US and three European countries including UK, Sweden and Denmark to analyze the dividend–price ratios ability to predict future stock returns and dividend growth. They apply VAR model similar to Cochrane (2008)'s methodology to analyze short and long horizon predictability of returns and dividend growth. Findings show that dividend-price ratio has predictive power for stock returns in countries like the UK and the US, and for dividend growth rates in others, such as Demark and Sweden. Their main contribution is to show that Predictability power of the dividend-price ratio is not similar across countries and predictability patterns in European stock markets are in many ways quite different from what characterize the US stock market.

Binsbergen and Koijen (2010) argue that a latent factor that aggregates information contained in the history of price-dividend ratios and dividend growth rates is able to improve the prediction regression. They find that both expected returns and expected dividend growth rates are predictable, time-varying and persistent but expected returns are more persistent than expected dividend growth rates.

Park (2010) shows that predictability of the stock returns by dividend-price ratio differs over time and across countries. He argues that the unbalanced predictive regression can explain why dividend-price ratio is a good predictor in some period but it does not show predictive power in the other period. He shows that when both return and dividend-price ratio are I(0), dividend-price ratio has predictive power for stock returns.

Chen, Da, and Zhao (2013) argue that the traditional approach based on the predictive regressions is sensitive to the choice of sample periods or predictive variables. They employ new method namely Implied Equity Cost of Capital (ICC) model to decompose returns that does not rely on predictability. They find that there is a significant component of cash flow news in stock returns, and that its importance increases with the investment horizon.

Welch and Goyal (2008) reexamine the performance of long list of variables that have been suggested by the literature as good predictors of equity premium. They find that some periods such as Oil shock 1973-1975 have significant positive contribution to the performance of some models. They conduct recursive forecast method and examine the out-of-sample performance of the predictors in forecasting stock returns using mainly two out-of-sample statistics including difference "Root Mean Squared Error" (RMSE) of conditional and unconditional forecasts and "R-Squared" similar to Campbell and Thompson (2008) to examine the out-of-sample performance of each model compare to unconditional forecast. They find that most models seem unstable or even spurious as diagnosed by their poor out-of-sample predictions and predictability of a variety of popular economic and financial variables from the literature does not hold up in out of sample forecasting exercises.

Kellard et al. (2010) compare stock return predictability in the United States and United Kingdom on the basis of dividend-price ratios. They examine in-sample and out-of-sample return predictability for these two stock markets and find the evidence of in sample predictability for both markets although the findings are stronger for UK market. then in order to check if investors are able to time the market using dividend model they apply Goyal and Welch (2008) model to examine the out-of-sample predictability and compare the results with historical average to find out if the model is able to beat the unconditional model or historical average. They find that the dividend-price ratio exhibits stronger out-of-sample forecasting ability in terms of MSFE in the United Kingdom versus the United States, and they attribute the difference to the higher proportion of dividend-paying firms in the United Kingdom. Overall, the results in this paper indicate that the predictive ability of dividend ratios improves when an index with a higher fraction of dividend-paying companies is considered.

Ferreira and Santa-Clara (2011) offer an approach to improve predictability of the stock returns. They propose a stock market return decomposition method named sum-of-the-parts (SOP) and show that this method has better performance in predicting returns compare to traditional model and historical average. This approach decomposes returns into three components of earnings growth, growth in price-earnings ratio and dividend-price ratio. Then, each component is forecasted separately and fitted values are used to forecast returns. They forecast earnings growth component with long run historical average. Because dividend–price ratio is highly persistent, they forecast it using the currently observed dividend–price ratio. They ignores the growth in the price–earnings ratio in the simplest version of the SOP method since they find this component trivial in magnitude in US. They examine the out-of-sample return predictability of the SOP method using S&P500 for long period of December 1927 to December 2007 and obtain out-of-sample R-Squared of 1.3% in monthly frequency. They find that this method improves the forecasting ability of the stock return compare to historical average benchmark as well as traditional predictive regression. The results are robust for UK and Japan.

McMillan and Wohar (2011) compare the sum-of-the-parts method with traditional model across countries. They compare three return forecasting models in eleven markets consists of G7 countries and four Asian markets (Hong Kong, Malaysia, Korea and Singapore). Accuracy of the forecast based on traditional model with dividend-yield as explanatory variable is compared with predictive model which includes sum-of-the-parts three return components as stock return predictors instead of using the fitted value of each component in forecast model- and SOP method as in Ferreira and Santa-Clara (2011). They evaluate the accuracy of the forecast by ten different techniques (i.e, Mean Absolute error (MAE), Root mean Squared Error (RMSE) and Mincer-Zarnowitz R^2 among others) by using monthly data for the period of 1973:01 to 2009:02 for G7 countries, Hong Kong and Singapore 1986:01 to 2009:02 for Malaysia and 1988:01 to 2009:02 for Korea. Their findings are consistent with the results in Ferreira and Santa-Clara (2011) for US and UK at monthly frequency. However, this is not the case for Japan. They conclude that sum-of-the-part may work well for some markets like UK, US, Italy and Korea, the evidence is not universal.

A number of empirical studies have investigated the predictability of stock returns using economic and financial variables.

Jordan,Vivan and Wohar (2014) compare the performance of fundamental, macro, and technical variables in terms of both statistical and economic significance to answer this question whether any variable beat the historical average. Their analysis is based on data in monthly frequency for fourteen European and Mediterranean countries over the period February 1995 to June2011. They apply predictive regression for individual countries with a list of predictors including dividend–price ratio, dividend-yield, Earnings–price ratio, dividend–payout ratio, risk-free rate, aggregate stock variance, price pressure, and change in volume are. They examine both in-sample and out-of-sample predictability of the variables for nominal return across all fourteen countries and find consistent predictability of stock market returns. Macro variables and to some extent technical variables consistently beat the historic average benchmark.

Seng and Hancock (2012) examine how changes in future earnings are predicted by fundamental signals. They apply fundamental analysis to investigate how detailed financial statement data are useful predictor of future earnings growth. Their sample includes international data from 1990 to 2000. Results signify that the fundamental signals are significant predictors of both short- and long-term future earnings changes.

Arnott and Asness (2003) examine whether payout ratio forecasts future aggregate earnings growth. Their sample includes US data for 130 years from 1871 through 2001.They focused on market portfolio, proxied by the S&P 500 Index to investigate the relationship between payout and future earnings growth. They found that low payout ratios historically lead low earnings growth. This finding contradicts the conventional belief that substantial reinvestment of retained earnings is associated with future earnings growth. The results proved robust to various sub-periods, to extensive controls for the mean reversion of earnings growth, and to a host of micro and macro variables.

Zhou and Ruland (2006) investigate the dividend-earnings relationship at the firm level, since they believe that results at the market level may potentially be dominated by a few large firms. Their findings also supported Arnott and Asness (2003), while holding under numerous specification tests.

Flint, Tan, and Tian (2010) examine the dividend-earnings relationship in Australia at the firm level. Analysis at the firm level, provides an apparent picture of the relationship between the dividend payout ratio and future earnings growth. They use payout ratio as a predictor of a firm's future earnings growth. Examining both listed and delisted firms on the Australian stock exchange over the period 1989 to 2008, they provide further evidence that the dividend payout ratio is positively linked to future earnings growth. The results hold over both one, three and five year periods.

Parker (2005) examine the relationship between the payout ratio and future earnings growth. He employs rolling regressions of 10-year future earnings growth on the current monthly payout ratio and find that there is a positive relationship between the payout ratio and earnings growth across the United States, Canada and Australia.

3. Model and Methodology

Ferreira and Santa-Clara (2011) consider a form of restrictions on stock return forecasts involving valuation ratios. They decompose returns into three components consist of growth rate in earnings, growth rate in price-earnings ratio, and dividend-price ratio. In this research we extend their method named sum-of-the-parts (SOP) by employing financial variables to improve the accuracy of the stock return forecasts. By definition, gross return on a broad market index at time t is

$$R_t = \frac{P_t + D_t - P_{t-1}}{P_{t-1}} = \frac{P_t - P_{t-1}}{P_{t-1}} + \frac{D_t}{P_{t-1}} \tag{1}$$

where $\frac{P_t - P_{t-1}}{P_{t-1}}$ is the capital gain (CG_t) and $\frac{D_t}{P_{t-1}}$ is the dividend yield (DY_t). Total gross return can be written as

$$1 + R_t = \frac{P_t}{P_{t-1}} + \frac{D_t}{P_{t-1}} = \frac{P_t + D_t}{P_{t-1}}$$

Hence, gross return of the stock market index is decomposed into dividend yield and capital gain:

$$1 + R_t = 1 + CG_t + DY_t \quad (2)$$

Let the capital gain component be

$$1 + CG_t = \frac{P_t}{P_{t-1}} = \frac{P_t/E_t}{P_{t-1}/E_{t-1}} \frac{E_t}{E_{t-1}} = \frac{M_t}{M_{t-1}} \frac{E_t}{E_{t-1}}$$
$$= (1+GM_t)(1+GE_t) \quad (3)$$

where E_t denotes earnings, $M_t = P_t/E_t$ is the price-earnings ratio, and $(1+GM_t) = \frac{M_t}{M_{t-1}}$ is the gross growth rate of the price-earnings multiple and $(1+GE_t) = \frac{E_t}{E_{t-1}}$ is the growth rate in earnings. Using (3), the dividend yield can be written as

$$DY_t = \frac{D_t}{P_{t-1}} = \frac{D_t}{P_t} \frac{P_t}{P_{t-1}} = DP_t(1 + GM_t)(1 + GE_t) \quad (4)$$

Where $DP_t = \frac{D_t}{P_t}$ is the dividend-price ratio. Based on (3) and (4), the gross return can be written as the product of growth rate of earnings and growth rate of price earnings ratio and the dividend-price ratio:

$$1 + R_t = (1+GM_t)(1+GE_t) + DP_t(1 + GM_t)(1 + GE_t)$$
$$= (1+GM_t)(1+GE_t)(1 + DP_t) \quad (5)$$

We make the above expression additive by taking natural log;

$$r_t = Ln(1 + R_t) = gm_t + ge_t + dp_t \quad (6)$$

Where gm_t is the natural log growth rate of the price-earnings multiple and ge_t is the natural log growth rate of earnings and dp_t is the log of one plus the dividend-price ratio. Following the approach taken by Ferreira and Santa-Clara (2011), equation (6) is used as the basis of our analysis in stock return forecasts.

As it is common in the return predictability literature, we examine the information content of financial variables for sum-of-the-parts return components. Financial variables are used one at a time to forecast each component of returns. Then fitted values are used in forecast model. Based on this analysis, we are able to evaluate the forecast accuracy of each variable in prediction of each component in-sample and out-of-sample. Furthermore, the forecast accuracy of stock returns in the framework of sum-of-the-Parts using financial variables as predictors of decomposed return components and SOP method by Ferreira and Santa Clara (2011) could be compared.

In order to start the process, bivariate predictive regressions are used with each component of return as the dependent variable. We run following regressions separately.

$$ge_{t+1} = \alpha_i + \beta_i x_{i,t} + \varepsilon_{i,t} \tag{7}$$

$$gm_{t+1} = \alpha_i + \beta_i x_{i,t} + \varepsilon_{i,t} \tag{8}$$

Where ge_{t+1} is the log of growth rate of aggregate earnings on each country MSCI equity index between time t and $t+1$. In the same way, gm_{t+1} is the log of growth rate in price-earnings ratio ,and dp_{t+1} is the natural log of the (1+ DP_{t+1}).The i subscript indexes one of K potential return components predictors (i= 1, . . . ,K). $x_{i,t}$ is lagged financial variable available at the end of time t used to forecast return components.$\varepsilon_{i,t}$ is zero-mean disturbance term.An equity return component forecast based on (7-8) is computed as

$$\widehat{Y}_{i,t+1} = \hat{\alpha}_{i,t} + \hat{\beta}_{i,t} x_{i,t} \tag{9}$$

Where $\widehat{Y}_{i,t+1}$ represent each return component and $\hat{\alpha}_{i,t}$ and $\hat{\beta}_{i,t}$are ordinary least squares (OLS) estimates of α_i and $\beta_i$respectively.

In order to examine out-of-sample (OOS) performance of each financial variable in prediction of return components, we generate out-of-sample forecasts of return components using a sequence of expanding windows. To do that, suppose sample of T observations for Y_t and $x_{i,t}$ is available. We divide the total sample into an initial in-sample estimation period comprised of the first m observations $t = 1, \dots, m$ and an out-of-sample period consists of the last n = T − m observations. One-step ahead return component forecasts are computed over these last n observations using equation (9). We follow this process for n = $n_0, \dots, T - 1$ and generating the sequence of out-of-sample return components forecasts $\widehat{Y}_i$.To start the procedure, we require an initial sample of size m . Then we evaluate the performance of forecasting model with an out-of-sample R-square similar to the one proposed by Goyal and Welch (2008) and Campbell and Thompson (2008). This statistic compares the predictive ability of the model with the historical average:

$$R_{OS}^2 = 1 - \frac{MSE_P}{MSE_M} \tag{10}$$

MSE_P is the mean square error of the out-of-sample predictions from the model and calculated as

$$MSE_P = \frac{1}{T-n_0} \sum_{n=n_0}^{T-1} (Y_{i,n+1} - \widehat{Y}_{i,n}) \, .$$

MSE_M is the mean square error of the historical sample mean:

$$MSE_M = \frac{1}{T - n_0} \sum_{n=n_0}^{T-1} (Y_{i,n+1} - \bar{Y}_{i,n})$$

$\bar{Y}_{i,n}$ is the historical mean of stock market returns up to time n .Obviously, when R_{OS}^2> 0, the predictive regression forecast is more accurate than the historical average in terms of MSE. Statistical significance of the results are evaluated using the MSE-F statistic proposed by McCracken (2007) which tests for the equality of the MSE of unconditional and conditional forecasts:

$$MSE - F = (T - n_0) \left(\frac{MSE_M - MSE_P}{MSE_P} \right) \tag{11}$$

The MSE-F statistic is formulated under the null that the forecast error from the regression model is equal to or larger than that from the historical average regression. A rejection of the null hypothesis indicates that the regression model has superior forecast performance than the benchmark.

We forecast each return component in equation (6) by a financial variable that shows the best performance out-of-sample among considered variables and use the fitted values to forecast stock return. Then forecast performance of the model that use the financial variables as predictors of return component in the framework of SOP and the original method introduced by Ferreira and Santa-Calara (2011) will be compared in terms of forecast error. The conclusion will be based on the sign, magnitude and significance of the OOS-R^2 for two models. Furthermore, the out-of-sample performance of the simple version of the SOP will be reported to be compared with the SOP with financial variables and SOP including the growth in price-earnings ratio (growth in multiple). Although growth in price-earnings ratio is trivial in US data, it is quite large and important in many countries worldwide. Ignoring this component in an international analysis, the result would be misleading.

4. Data and Variables

The Morgan Stanley Capital International (MSCI) equity indices in local currencies obtained from Bloomberg. All data are in monthly frequency to predict the monthly stock market return. The values in local currencies are taken to emphasize on domestic investor's perspective. Our sample starts, when possible, in February 1995 and ends in November 2014.

Return (r_t).The log gross returns at time t calculated similar to Jordan et.al (2014) as the log changes in MSCI equity indices;

$$r_t = \text{Ln}\,(1+R_t) = \text{Ln}\,({MSCI_t}/{MSCI_{t-1}})$$

Growth in price-earnings ratio (gm_t) .The monthly growth in multiple is calculated by log changes in price-earnings ratio in each month. We use the following to construct this variable.

$$gm_t = \text{Ln}\,({M_t}/{M_{t-1}})$$

Growth in earnings (ge_t).This is the log changes in aggregate earnings on the country equity index over the last 12 months. The following is used to calculate growth in earnings.

$$ge_t = \text{Ln}\left({}^{E_t}\!/_{E_{t-1}} \right)$$

Dividend–price ratio (dp_t).This variable is the logarithm of one plus current dividend-price ratio which is a 12-month moving sum of dividends paid on the MSCI country's equity index over current stock price index. It is constructed by dividing “gross aggregate dividend yield” by 12 to find the monthly value of this variable. Bloomberg reports this value in percentage thus we convert it to decimal by dividing by 100. Following Ferreira and Santa Clara (2011), we calculate this variable as

$$dp_t = Ln(1 + {}^{D_t}\!/_{P_t})$$

A major challenge in stock market returns prediction is the decision about the variables being used in forecasting regressions. The same concern applies in predicting return components. The existence of the predictability is always a challenge in the literature as well. Similar to return, there is evidence of aggregate earnings predictability as documented by Freeman et.al (1982).

We take the variables that has shown reasonable predictive power in the literature for stock returns and earnings growth as well as those that logically are able to predict the earnings growth and growth in price-earnings ratio. There are enormous studies in the literature that show that financial variables have predictive power for stock return and earnings growth (i.e., Ou, 1990, Zhou and Ruland (2006), and Arnott and Asness (2003), Flint et.al (2010)). We take the following nine financial variables for further analysis;

- Dividend-payout ratio (Payout). This variable is the difference between the log of dividends (12-month moving sums of dividends paid on equity index) and the log of earnings (12-month moving sums of earnings on equity index).

- Growth in payout-ratio (Payoutgw). This is the log changes in Dividend-payout ratio.

- Price-to-book ratio (P/B). This variable is the ratio of the stock price index to the total book value of equity index.

- Return-on-equity (ROE). This is the ratio of 12-month moving sums of earnings to book value of equity for each country equity index.

- Growth in return-on-equity (ROEgw). The log changes in the Return-on-equity (ROE).

- Growth in earnings before interest and taxes (EBITgw). This variable is the log changes in operating income (EBIT) of index constitutes.

- Price-to-EBITDA ratio (P/EBITDA). This ratio is the difference between the log of prices and log of 12-month moving sums of earnings before interest, taxes, depreciation, and amortization.

- Growth in market capitalization (Marcapgw). This variable is the log changes in index market capitalization. Index Market Capitalization represents the aggregate calculation of constituent market values used to determine the index value.

- Growth in trade volume (Volgw). This variable is constructed by finding the log changes in index trade volume.

4.1. Data Description

Table 1 reports mean and standard deviation of the realized components of stock market returns. Data are in monthly frequency from February 1995 through November 2014 whenever data are available. For some countries data are available for shorter period of time. Thus sample length is not the same for all countries.

Table 1 Panel A, shows that average of the mean returns considering all developed countries is 0.68 per cent per month with the standard deviation of the 5.71 per cent during the full sample period. Japan and Austria show the lowest mean stock market returns among all developed markets during the sample period. Denmark and Sweden are two countries that have the highest returns during the full sample period with more than 12% per year while the standard deviation of the return in Denmark is slightly less than the average. The highest standard deviation associates with Finland while the Australia and UK show the lowest standard deviation of the returns among all.

Considering all developed countries, growth in price-earnings ratio (gm) is worth about 0.11 of the total of 0.68 mean return while growth in earnings is responsible for 0.34 out of 0.68.

Table 1 summary statistics of return components

Note: This table reports mean and standard deviation of the realized components of stock market returns. Data are in monthly frequency. Date of the first observation in each series is reported in "First Obs" column. OBS shows number of observations in each series. SUM represents sum of the mean of three return components in sum-of-the-parts method. Diff shows the difference between mean monthly stock market returns (r) and SUM column. Panel A reports summary statistics for 18 developed markets and Panel B reports summary statistics for 18 emerging markets according to MSCI. r is the natural log of monthly nominal stock market returns on the MSCI index of each country including dividends. gm is the natural log of growth rate of price-earnings ratio, ge is the natural log of earnings growth and dp is the natural log of monthly dividend-price ratio. The sample period is from February 1995 through November 2014. All values are shown in percentage.

Country Name	***r***		***gm***		***ge***		***dp***		***First Obs***	***OBS***	***SUM***	**Diff**
	Mean	***Std***	***Mean***	***Std***	***Mean***	***Std***	***Mean***	***Std***				
Panel A : Developed Markets												
Australia	0.89	3.74	0.07	7.65	0.36	6.99	0.44	0.08	Feb-1995	238	0.87	0.02
Austria	0.20	6.84	1.35	27.58	-1.35	27.65	0.21	0.09	Apr-1995	216	0.21	0.00
Canada	0.87	4.50	0.03	6.65	0.35	19.60	0.18	0.05	Feb-1995	236	0.56	0.31
Denmark	1.06	5.43	0.04	8.12	0.85	6.93	0.15	0.06	Feb-1995	238	1.04	0.02
Finland	0.88	9.29	-0.36	20.33	0.99	19.18	0.24	0.14	Apr-1995	230	0.88	0.00
France	0.84	5.00	0.74	24.37	-0.09	24.10	0.24	0.08	Apr-1995	223	0.89	-0.05
Germany	0.61	6.22	0.13	17.40	0.25	17.54	0.22	0.07	Feb-1995	231	0.61	0.01
Hong Kong	0.86	7.19	-0.50	13.65	1.03	12.18	0.30	0.08	Feb-1995	225	0.83	0.03
Italy	0.35	6.20	0.80	19.44	-0.81	19.82	0.28	0.13	Apr-1995	218	0.27	0.08
Japan	-0.12	5.31	-2.34	49.27	2.70	46.91	0.11	0.05	Feb-1995	195	0.47	-0.59
Netherlands	0.75	5.13	1.96	27.49	-1.47	27.32	0.26	0.08	Apr-1995	223	0.75	0.01
Norway	0.87	6.40	0.55	32.64	0.01	32.78	0.26	0.10	Feb-1995	234	0.83	0.05
Portugal	0.41	5.68	0.48	8.56	-0.40	7.00	0.31	0.16	Apr-1995	233	0.40	0.01
Singapore	0.47	6.59	-0.14	9.96	0.33	8.19	0.26	0.09	Feb-1995	238	0.45	0.02
Sweden	1.05	6.43	-1.48	25.42	2.32	24.75	0.22	0.09	Feb-1995	235	1.06	-0.01
Switzerland	0.71	4.51	0.19	15.90	0.34	15.78	0.18	0.06	Feb-1995	238	0.71	0.00
UK	0.82	3.84	0.34	16.74	0.18	16.13	0.31	0.07	Feb-1995	232	0.83	-0.01
USA	0.79	4.46	0.08	5.21	0.56	10.93	0.15	0.04	Feb-1995	238	0.79	0.00
Average-Developed	0.68	5.71	0.11	18.69	0.34	19.10	0.24	0.08				

Table 1 - (Continued)

Country Name	*r*		*gm*		*ge*		*dp*		*First Obs*	*NOBS*	*SUM*	**Diff**
	Mean	*Std*	*Mean*	*Std*	*Mean*	*Std*	*Mean*	*Std*				
Panel B : Emerging Markets												
Brazil	0.71	11.03	-0.32	21.04	0.79	19.35	0.22	0.10	Feb-95	238	0.69	0.02
Chile	0.47	6.90	0.99	19.77	-0.95	41.63	0.22	0.06	Feb-95	236	0.26	0.21
China	0.29	9.86	0.03	15.84	0.03	12.15	0.21	0.06	Dec-95	228	0.27	0.02
Colombia	1.53	9.07	-0.68	20.61	1.91	18.31	0.28	0.12	Feb-96	213	1.52	0.01
Hungary	0.90	9.19	0.15	14.81	0.58	12.21	0.16	0.08	Jul-96	215	0.89	0.01
India	0.99	7.68	-0.13	9.92	0.99	6.17	0.12	0.03	Feb-95	238	0.98	0.01
Indonesia	1.10	9.70	0.17	26.00	0.70	24.44	0.21	0.07	Feb-95	215	1.08	0.02
Korea	0.19	7.35	-0.07	16.42	0.07	14.48	0.14	0.04	Feb-95	213	0.13	0.05
Malaysia	0.35	6.70	0.15	9.42	-0.08	9.10	0.26	0.08	Feb-95	225	0.33	0.02
Mexico	1.00	8.20	0.11	10.93	0.74	8.95	0.14	0.04	Feb-95	238	0.99	0.01
Peru	1.17	8.81	0.57	13.58	0.33	10.48	0.26	0.11	Feb-95	238	1.16	0.01
Philippines	0.54	7.36	0.19	8.74	0.15	6.92	0.19	0.09	Feb-95	219	0.52	0.02
Poland	0.86	8.34	-0.33	19.90	0.96	18.19	0.20	0.13	Feb-95	235	0.83	0.03
Russia	1.09	15.40	1.38	54.00	-0.62	54.41	0.14	0.10	Feb-96	226	0.90	0.19
South Africa	1.15	5.66	0.06	9.84	0.60	8.32	0.26	0.05	Jul-95	229	0.92	0.23
Taiwan	0.32	7.29	-0.15	21.65	0.26	21.09	0.21	0.14	Feb-95	238	0.32	0.00
Thailand	0.18	9.49	-1.45	16.89	1.36	14.94	0.27	0.07	Feb-95	210	0.18	0.00
Turkey	2.85	12.81	0.43	21.41	2.18	17.75	0.20	0.07	Feb-95	225	2.82	0.03
Average-Emerging	0.87	8.94	0.06	18.38	0.56	17.72	0.20	0.08				

The reported standard deviation show the high variation on the data for these two return components. Although growth in price-earnings ratio (gm) is not significant in magnitude in some countries such as Canada, Denmark, Australia, and USA, it is quite large in other developed countries and thus cannot be ignored in the analysis.

Dividend price ratios for most countries are around the average of this ratio for all developed countries. The highest value in this column associates with Australia (0.44) with variation same as average while the least value is for Japan (0.11) with the standard deviation less than average of all developed countries.US data for this series are clustered around the mean as shown the least standard deviations in this series among all. It shows the least variation in gm among all countries as well.

The last column shows the difference between realized MSCI indices stock returns and sum of the mean of three return components as in sum-of-the-parts method. Zero value is desirable and hence, the more deviations from zero in this column, the more deviations of the sum of the three return components from the realized returns. As reported in this column, the sum of average values of the three stock return components equals the average stock returns in most developed countries. The results are consistent with Ferreira and Santa-Clara (2011).

Panel B in Table 1 shows a huge differences between the maximum and minimum values of the mean return among emerging markets. Turkey represents the most profitable market among all emerging and developed markets. The least mean returns associates with two markets of Thailand and Korea. Overall, average of the returns in emerging markets are higher with larger standard deviation than the developed markets. The average growth in price-earnings ratio in emerging markets is almost half of that of developed markets with similar standard deviations while the average of growth in earnings is higher in emerging markets with less standard deviation compared to developed market. The average of the earnings growth in emerging markets is almost 65 per cent higher than that of the developed markets. Turkey shows the highest value of the earnings growth which is almost four times larger than the average of all emerging countries for this data series. Average of the dividend price ratio in emerging markets is slightly less than that of the developed markets while they have same standard deviations. The standard deviations of the averaged dividend-price ratio is the least among all variables in both developed and emerging markets.

Table 2: Statistics of stock returns and return components across sub-periods in developed markets.

Note: Mean and standard deviation of r, gm, ge ,and dp are reported in separate panels for full sample period from February 1995 through November 2014 as well as three sub-periods including 1995M02-2000M12, 2001M01-2008M12, and 2009M01-2014M11.All data are in monthly frequency and values are in percentage. Full observations in sub-samples are 71, 96, and 71 for 1995M2-2000M12, 2001M1-2008M12, and 2009M1-2014M11 respectively. The difference between the reported number of observations in each country and the earlier mentioned full number of observations in each sub-period shows the missing data in each sub-sample and for each country.

Panel A: return (r)

Country Name	***Full Sample***			***1st Sub-sample***			***2nd Sub-sample***			***3rd Sub-sample***		
	Mean	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***
Australia	0.891	3.740	238	1.126	3.587	71	0.629	3.856	96	1.011	3.760	71
Austria	0.204	6.845	216	0.328	5.725	69	-0.063	7.710	79	0.389	6.909	68
Canada	0.870	4.501	236	1.555	5.200	71	0.336	4.550	94	0.893	3.552	71
Denmark	1.057	5.426	238	1.695	5.306	71	0.161	5.855	96	1.629	4.811	71
Finland	0.879	9.295	230	3.616	9.261	69	-0.953	10.317	96	0.679	6.845	65
France	0.842	4.999	223	1.937	5.382	69	-0.067	4.735	83	0.840	4.764	71
Germany	0.613	6.220	231	1.666	5.973	71	-0.572	6.817	89	1.046	5.469	71
Hong Kong	0.858	7.193	225	0.816	9.385	70	0.467	6.085	84	1.361	5.867	71
Italy	0.347	6.200	218	1.471	6.855	67	-0.424	5.227	96	0.323	6.807	55
Japan	-0.122	5.305	195	-0.877	5.081	53	-0.115	5.429	84	0.559	5.322	58
Netherlands	0.755	5.129	223	1.936	5.171	69	-0.233	5.468	90	0.869	4.321	64
Norway	0.874	6.402	234	0.834	6.112	71	0.747	7.561	92	1.080	4.968	71
Portugal	0.408	5.681	233	1.621	6.060	69	-0.313	5.818	96	0.195	4.918	68
Singapore	0.467	6.594	238	0.235	8.109	71	0.168	6.370	96	1.101	5.079	71
Sweden	1.048	6.433	235	2.063	6.543	71	-0.008	7.392	93	1.416	4.587	71
Switzerland	0.705	4.507	238	1.740	5.324	71	-0.215	4.405	96	0.915	3.437	71
UK	0.816	3.840	232	1.289	3.602	71	0.356	3.931	90	0.926	3.941	71
USA	0.787	4.462	238	1.606	4.384	71	-0.242	4.500	96	1.359	4.271	71
Average-Developed	0.683	5.710		1.370	5.948		-0.019	5.890		0.922	4.979	

Table 2 -*Panel B:* growth in multiple (gm)

Country Name	***Full Sample***			***1st Sub-sample***			***2nd Sub-sample***			***3rd Sub-sample***		
	Mean	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***
Australia	0.068	7.650	238	0.161	7.777	71	-0.163	6.574	96	0.287	8.881	71
Austria	1.348	27.583	216	-0.392	13.582	69	-1.256	20.087	79	6.138	41.833	68
Canada	0.033	6.651	236	0.390	8.196	71	-0.700	6.051	94	0.646	5.608	71
Denmark	0.042	8.124	238	0.219	7.850	71	-0.557	7.628	96	0.673	9.053	71
Finland	-0.357	20.334	230	0.138	14.776	69	-0.740	13.137	96	-0.317	31.478	65
France	0.741	24.371	223	0.105	21.742	69	1.064	33.041	83	0.981	12.044	71
Germany	0.134	17.402	231	-0.617	8.612	71	0.991	22.760	89	-0.189	16.370	71
Hong Kong	-0.500	13.653	225	-0.739	18.435	70	-0.652	10.844	84	-0.086	11.036	71
Italy	0.803	19.442	218	-1.159	10.992	67	-0.699	14.547	96	5.816	31.059	55
Japan	-2.342	49.273	195	4.551	61.034	53	-7.417	56.484	84	-1.291	11.654	58
Netherlands	1.960	27.487	223	0.388	6.689	69	1.073	22.061	90	4.902	43.749	64
Norway	0.549	32.645	234	-0.199	11.137	71	1.642	48.999	92	-0.120	17.304	71
Portugal	0.482	8.560	233	0.578	7.089	69	-0.412	8.804	96	1.646	9.501	68
Singapore	-0.145	9.956	238	-0.069	13.168	71	-0.760	9.606	96	0.611	5.992	71
Sweden	-1.483	25.422	235	0.718	8.388	71	-4.706	39.062	93	0.537	7.864	71
Switzerland	0.192	15.899	238	0.677	20.266	71	1.233	13.275	96	-1.700	14.164	71
UK	0.343	16.738	232	1.039	4.815	71	0.636	21.069	90	-0.726	18.308	71
USA	0.075	5.209	238	0.665	4.431	71	-0.577	5.099	96	0.367	5.996	71
Average-eveloped	0.108	18.689		0.359	13.832		-0.667	19.951		1.010	16.772	

Table 2 - ***Panel C:*** growth in earnings (ge)

Country Name	*Full Sample*			*1st Sub-sample*			*2nd Sub-sample*			*3rd Subsample*		
	Mean	*Std*	*OBS*	*Mean*	*Std*	*OBS*	*Mean*	*Std*	*OBS*	*Mean*	*Std*	*OBS*
Australia	0.363	6.986	238	0.542	7.628	71	0.396	5.909	96	0.139	7.718	71
Austria	-1.350	27.652	216	0.561	13.671	69	1.014	20.700	79	-6.037	41.623	68
Canada	0.346	19.600	236	0.591	5.961	71	0.608	29.601	94	-0.247	9.463	71
Denmark	0.852	6.930	238	1.335	5.804	71	0.543	0.063	96	0.785	8.595	71
Finland	0.993	19.183	230	3.377	12.842	69	-0.466	9.271	96	0.616	31.694	65
France	-0.088	24.101	223	1.627	21.026	69	-1.144	32.883	83	-0.519	11.902	71
Germany	0.252	17.542	231	2.085	7.289	71	-1.767	23.660	89	0.949	15.658	71
Hong Kong	1.030	12.178	225	1.222	17.155	70	0.746	8.926	84	1.178	9.479	71
Italy	-0.814	19.818	218	2.446	9.606	67	-0.078	14.364	96	-6.069	32.561	55
Japan	2.698	46.906	195	-3.225	54.942	53	7.124	55.834	84	1.701	11.515	58
Netherlands	-1.470	27.317	223	1.300	4.686	69	-1.597	21.772	90	-4.277	43.814	64
Norway	0.014	32.777	234	0.852	10.119	71	-1.221	49.327	92	0.775	17.531	71
Portugal	-0.396	7.000	233	0.808	3.830	69	-0.168	7.614	96	-1.942	8.281	68
Singapore	0.329	8.190	238	0.123	10.970	71	0.592	8.372	96	0.181	3.388	71
Sweden	2.321	24.746	235	1.203	5.923	71	4.482	38.521	93	0.607	7.160	71
Switzerland	0.338	15.784	238	0.938	20.169	71	-1.470	13.094	96	2.183	13.992	71
UK	0.175	16.128	232	-0.008	3.750	71	-0.268	20.046	90	0.920	18.235	71
USA	0.558	10.926	238	0.606	2.442	71	-0.590	10.669	96	2.062	15.480	71
Average-Developed	0.342	19.098		0.910	12.101		0.374	20.590		-0.389	17.116	

Table 2 - *Panel D:* dividend-price ratio (dp)

Country Name	***Full Sample***			***1st Sub-sample***			***2nd Sub-sample***			***3rd Sub-sample***		
	Mean	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***
Australia	0.444	0.077	238	0.406	0.049	71	0.421	0.063	96	0.513	0.074	71
Austria	0.211	0.093	216	0.187	0.031	69	0.160	0.081	79	0.293	0.092	68
Canada	0.178	0.047	236	0.158	0.038	71	0.155	0.031	94	0.230	0.027	71
Denmark	0.147	0.064	238	0.161	0.103	71	0.151	0.029	96	0.126	0.037	71
Finland	0.244	0.140	230	0.088	0.018	69	0.242	0.069	96	0.413	0.089	65
France	0.241	0.083	223	0.196	0.062	69	0.204	0.061	83	0.327	0.054	71
Germany	0.222	0.065	231	0.182	0.039	71	0.207	0.053	89	0.282	0.059	71
Hong Kong	0.298	0.082	225	0.320	0.089	70	0.303	0.066	84	0.269	0.083	71
Italy	0.277	0.135	218	0.153	0.028	67	0.313	0.111	96	0.365	0.146	55
Japan	0.114	0.052	195	0.066	0.008	53	0.102	0.034	84	0.177	0.030	58
Netherlands	0.258	0.083	223	0.206	0.051	69	0.281	0.075	90	0.282	0.097	64
Norway	0.264	0.102	234	0.182	0.039	71	0.258	0.083	92	0.352	0.097	71
Portugal	0.314	0.159	233	0.205	0.035	69	0.268	0.068	96	0.488	0.185	68
Singapore	0.262	0.089	238	0.165	0.043	71	0.301	0.069	96	0.305	0.070	71
Sweden	0.221	0.092	235	0.130	0.023	71	0.226	0.076	93	0.303	0.069	71
Switzerland	0.178	0.063	238	0.125	0.024	71	0.157	0.034	96	0.258	0.034	71
UK	0.310	0.067	232	0.266	0.051	71	0.303	0.058	90	0.362	0.056	71
USA	0.153	0.036	238	0.139	0.040	71	0.146	0.026	96	0.177	0.031	71
Average-Developed	0.241	0.085		0.183	0.042		0.233	0.060		0.307	0.074	

As it is mentioned earlier, the last column of the table shows the difference between realized MSCI indices of stock market returns and sum of the mean of three return components as in sum-of-the-parts method. The Diffs are zero and close to zero in most emerging countries as reported in Table 1 Panel B.

The Diff column in Table 1 reports not zero values for some countries. A reason for that would be missing data in their series. To further investigate the issue, we construct three sub-samples. The first sub-sample includes tech-bubble, the second includes financial crisis 2007-2008 and the last sub-sample considers post-crisis 2007 up to the end of sample period.

Tables 2 and 3 report monthly mean and standard deviation of the each variable in separate panels for developed and emerging markets respectively during full sample period from February 1995 through November 2014 as well as three sub-samples including 1995M1-2000M12 , 2001M1-2008M12 , and 2009M1-2014M11.

Panel A in Table 2 reports the summary statistics of log realized returns (r).This Panel shows that during the first sub-sample from 1995M1-2000M12, all developed countries experience a positive return on average. The only exception is Japan with mean return of -0.88. There are many missing data in this country ‘series during this period as well as the other two sub-samples. Next sub-sample that includes collapse of tech-bubble and financial crisis 2007-2008 is dominated by countries with negative returns. Although the average of the monthly mean stock returns for all developed countries is negative during this period, there are some countries such as Australia, Denmark, Hong Kong, Norway, and UK with positive mean stock returns. There are many countries with missing data in this sub-period that might be the reason we observe undesirable non-zero values in column Diff of Table 1. In the last sub-sample, average of the mean return for all countries improves but it is still less than the first sub-sample. The four countries that show significant missing observations during this sub-sample are Finland, Italy, Japan, and Netherland.

Panel B in Table 2 shows statistics for log of growth rate in multiple (gm). This Panel reports that average growth in multiple for all developed countries is positive during the first and third sub-sample while it is negative in the second sub-sample. This pattern is similar to the one we observe in Panel A for return (r).

Panel C in Table 2 reports the statistics for log of growth rate in earnings (ge).Panel C does not show any special pattern in growth of earnings over the sub-samples. The average of the mean of this variable for all developed countries is positive for two first sub-periods but it turns negative in last sub-sample. Three countries have the most contribution in changing the sign of "ge" in third sub-period including Austria, Italy, and Netherland.

Panel D in Table 2 reports the summary statistics for log of dividend-price ratio. This Panel shows a gradual increase in average of the mean and variation of this variable for all developed markets across all three sub-period. The highest value in full sample period is for Australia, this country has kept its superior across all sub-periods. Japan has shown the lowest value for this variable among all other developed countries throughout full sample period and it has kept its position across all sub-periods.

Table 3 reports summary Statistics of stock return and return components in separate panels over three distinct sub-periods in emerging markets. Panel A in Table 3 shows that there is a gradual increase on average of mean returns for all emerging countries across sub-periods. This pattern reverses for average of return's standard deviations. There are many countries in the first sub-sample with negative returns mainly due to some crises in this time period such as Asian crisis 1997, Russian Crisis 1998 and collapse of LTCM 1998. Thailand and then after Korea are two countries that experience worse situations in terms of returns during the first sub-period. There are many missing observations in this sub-sample that might affect the difference between the sum of the three return components and stock return.

When two market groups are compared in terms of returns over sup-periods we find rather obvious pattern that justifies the separation of these two groups. In the first sub-sample less countries in developed markets and more countries in emerging markets experience negative mean of stock returns. Average of the mean returns for all countries is much greater in developed markets than that of the emerging markets during the first sub-period. The pattern reverses in the second sub-sample, developed market on average experience negative returns while emerging markets dominantly are operated in usual way and the average of mean stock returns for these markets is positive. All countries in two groups operate well and positively in terms of return during the 3rd sub-periods. The average on developed markets' mean returns is less than that of emerging markets though.

Panel B in Table 3 shows that means of growth rate in price-earnings ratios on average is negative across the first two sub-samples in emerging markets, however, it turns to positive during the last sub-period. Similar to what we see in Panel A, there are many countries with missing observations during the first sub-period.

Table 3: Statistics of stock return and return components across sub-periods in emerging markets.

Note: Mean and standard deviation of r, gm, ge ,and dp are reported in separate panels for full sample period from February 1995 through November 2014 as well as three sub-periods including 1995M02-2000M12, 2001M01-2008M12, and 2009M01-2014M11.All data are in monthly frequency and values are in percentage. Full observations in sub-samples are 71, 96, and 71 for 1995M2-2000M12, 2001M1-2008M12, and 2009M1-2014M11 respectively. The difference between the reported number of observations in each country and the earlier mentioned full number of observations in each sub-period shows the missing data in each sub-sample and for each country.

Panel A: return (r)

Country Name	***Full Sample***			***1st Sub-sample***			***2nd Sub-sample***			***3rd Sub-sample***		
	Mean	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***
Brazil	0.715	11.035	238	0.319	12.399	71	1.060	11.818	96	0.645	8.285	71
Chile	0.468	6.897	236	-0.370	7.399	71	0.902	6.797	94	0.733	6.521	71
China	0.291	9.855	228	-1.275	13.740	61	0.827	9.095	96	0.910	6.162	71
Colombia	1.531	9.068	213	-0.542	10.786	46	2.776	9.398	96	1.191	7.025	71
Hungary	0.903	9.193	215	2.192	12.226	54	0.393	7.984	96	0.586	7.890	65
India	0.995	7.684	238	0.459	8.638	71	0.937	8.062	96	1.607	6.035	71
Indonesia	1.102	9.697	215	-1.190	13.977	58	2.014	8.500	86	1.869	5.888	71
Korea	0.185	7.353	213	-2.892	8.404	46	1.110	7.896	96	0.929	5.076	71
Malaysia	0.351	6.698	225	-1.173	10.821	58	0.610	5.127	96	1.244	3.117	71
Mexico	1.000	8.199	238	0.820	10.678	71	1.035	7.271	96	1.133	6.467	71
Peru	1.171	8.808	238	0.019	8.853	71	2.167	9.303	96	0.977	8.007	71
Philippines	0.537	7.355	219	-0.566	9.676	60	0.171	6.961	88	1.923	5.116	71
Poland	0.863	8.341	235	1.544	10.832	71	0.355	7.698	93	0.846	6.044	71
Russia	1.094	15.396	226	1.515	25.217	59	1.151	10.561	96	0.666	9.129	71
South Africa	1.147	5.658	229	0.094	0.852	62	1.203	5.848	96	1.391	3.704	71
Taiwan	0.315	7.294	238	-0.169	8.356	71	-0.012	7.775	96	1.243	5.199	71
Thailand	0.181	9.487	210	-4.224	14.516	43	0.921	8.373	96	1.847	5.628	71
Turkey	2.851	12.814	225	5.494	17.191	71	1.546	11.812	83	1.734	7.490	71
Average- Emerging	0.872	8.935		0.003	11.364		1.065	8.349		1.193	6.266	

Table 3 -Panel B: growth in multiple (gm)

Country Name	***Full Sample***			***1st Sub-sample***			***2nd Sub-sample***			***3rd Sub-sample***		
	Mean	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***
Brazil	-0.318	21.042	238	-1.543	33.955	71	-0.625	13.542	96	1.321	9.638	71
Chile	0.989	19.773	236	-0.078	17.643	71	1.964	26.722	94	0.767	7.081	71
China	0.030	15.836	228	1.375	26.831	61	-0.501	10.126	96	-0.406	7.402	71
Colombia	-0.679	20.612	213	-0.332	15.464	46	-1.775	27.749	96	0.576	9.205	71
Hungary	0.151	14.812	215	-0.368	16.343	54	-1.223	11.187	96	2.610	17.817	65
India	-0.134	9.919	238	-0.634	12.322	71	-0.366	9.654	96	0.680	7.337	71
Indonesia	0.175	26.000	215	2.307	42.437	58	-1.691	21.341	86	0.691	6.232	71
Korea	-0.073	16.419	213	-0.470	27.793	46	0.126	13.311	96	-0.083	8.905	71
Malaysia	0.153	9.422	225	0.648	14.827	58	-0.277	8.038	96	0.328	4.108	71
Mexico	0.110	10.927	238	-0.390	14.966	71	-0.122	8.948	96	0.926	8.403	71
Peru	0.565	13.584	238	-0.014	15.830	71	0.953	12.929	96	0.621	12.114	71
Philippines	0.186	8.738	219	0.528	9.864	60	-0.423	10.009	88	0.653	5.518	71
Poland	-0.334	19.899	235	1.938	16.790	71	-2.412	22.183	93	0.117	19.592	71
Russia	1.381	54.000	226	3.577	103.460	59	0.983	14.746	96	0.093	14.238	71
South Africa	0.060	9.839	229	-0.089	1.057	62	-0.038	12.392	96	0.892	6.161	71
Taiwan	-0.148	21.646	238	-0.443	9.621	71	0.460	18.480	96	-0.673	32.085	71
Thailand	-1.450	16.893	210	-5.587	25.177	43	-0.012	17.101	96	0.728	7.713	71
Turkey	0.434	21.406	225	-1.978	28.374	71	2.400	21.924	83	0.548	9.362	71
Average- Emerging	0.061	18.376		-0.086	24.042		-0.143	15.577		0.577	10.717	

Table 3 - Panel C: growth in earnings (ge)

Country Name	Full Sample			1st Sub-sample			2nd Sub-sample			3rd Sub-sample		
	Mean	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***	***Mean***	***Std***	***OBS***
Brazil	0.793	19.354	238	1.651	33.105	71	1.286	9.727	96	-0.731	6.357	71
Chile	-0.953	41.631	236	-0.543	15.456	71	-1.894	64.685	94	-0.116	4.300	71
China	0.029	12.149	228	-2.873	22.036	61	1.105	5.147	96	1.072	3.656	71
Colombia	1.912	18.307	213	-0.585	10.516	46	4.070	25.973	96	0.612	4.033	71
Hungary	0.582	12.211	215	2.461	12.470	54	1.441	7.720	96	-2.247	16.404	65
India	0.990	6.167	238	0.950	7.936	71	1.150	5.414	96	0.812	5.091	71
Indonesia	0.698	24.437	215	-3.655	40.136	58	3.454	19.938	86	0.916	2.475	71
Korea	0.068	14.479	213	-2.809	26.380	46	0.906	9.058	96	0.799	8.323	71
Malaysia	-0.077	9.103	225	-2.002	15.580	58	0.558	6.233	96	0.639	3.264	71
Mexico	0.738	8.948	238	1.066	11.620	71	0.809	8.637	96	0.314	5.875	71
Peru	0.331	10.480	238	-0.212	13.061	71	0.813	9.629	96	0.222	8.650	71
Philippines	0.149	6.918	219	-1.175	6.044	60	0.363	9.262	88	1.002	3.054	71
Poland	0.964	18.195	235	-0.506	12.910	71	2.556	21.366	93	0.349	18.277	71
Russia	-0.615	54.408	226	-2.309	105.153	59	-0.101	11.627	96	0.097	12.912	71
South Africa	0.603	8.319	229	0.080	0.957	62	0.830	9.241	96	0.239	7.336	71
Taiwan	0.258	21.087	238	0.200	5.637	71	-0.719	16.550	96	1.638	33.147	71
Thailand	1.359	14.940	210	1.188	24.485	43	1.824	14.039	96	0.835	6.217	71
Turkey	2.184	17.753	225	7.216	21.993	71	-1.090	19.428	83	0.980	6.542	71
Average- Emerging	0.556	17.716		-0.103	21.415		0.964	15.204		0.413	8.662	

Table 3 - Panel D: dividend-price ratio (dp)

Country Name	*Full Sample*			*1st Sub-sample*			*2nd Sub-sample*			*3rd Sub-sample*		
	Mean	*Std*	*OBS*	*Mean*	*Std*	*OBS*	*Mean*	*Std*	*OBS*	*Mean*	*Std*	*OBS*
Brazil	0.220	0.103	238	0.111	0.092	71	0.229	0.055	96	0.316	0.044	71
Chile	0.225	0.055	236	0.241	0.056	71	0.224	0.066	94	0.210	0.028	71
China	0.209	0.061	228	0.214	0.081	61	0.189	0.051	96	0.232	0.044	71
Colombia	0.283	0.122	213	0.357	0.158	46	0.277	0.122	96	0.244	0.058	71
Hungary	0.157	0.079	215	0.093	0.025	54	0.156	0.058	96	0.211	0.094	65
India	0.124	0.031	238	0.133	0.032	71	0.128	0.035	96	0.111	0.019	71
Indonesia	0.206	0.073	215	0.141	0.045	58	0.247	0.072	86	0.211	0.053	71
Korea	0.138	0.039	213	0.147	0.025	46	0.161	0.037	96	0.100	0.013	71
Malaysia	0.255	0.078	225	0.180	0.085	58	0.285	0.062	96	0.276	0.047	71
Mexico	0.145	0.036	238	0.136	0.043	71	0.155	0.034	96	0.140	0.026	71
Peru	0.265	0.107	238	0.224	0.100	71	0.321	0.089	96	0.230	0.104	71
Philippines	0.185	0.092	219	0.086	0.024	60	0.207	0.086	88	0.241	0.067	71
Poland	0.198	0.133	235	0.099	0.039	71	0.165	0.104	93	0.339	0.110	71
Russia	0.135	0.103	226	0.041	0.058	59	0.127	11.627	96	0.226	0.095	71
South Africa	0.256	0.050	229	0.234	0.037	62	0.268	0.057	96	0.260	0.044	71
Taiwan	0.208	0.135	238	0.083	0.022	71	0.232	0.135	96	0.302	0.107	71
Thailand	0.268	0.075	210	0.246	0.062	43	0.270	0.084	96	0.279	0.066	71
Turkey	0.204	0.071	225	0.217	0.083	71	0.190	0.072	83	0.206	0.053	71
Average- Emerging	0.205	0.080		0.166	0.059		0.213	0.714		0.230	0.059	

Panel C in Table 3 reports the statistics for earnings growth. This Panel shows there are many countries with negative mean of earnings growth rates in the first sub-sample including China, Indonesia, Korea, Malaysia, and Russia. There are many missing observations during the first sup-period that could explain non-zero Diff for some countries in Table 1.

Panel D in Table 3 shows that averages of the means for dividend price ratios in emerging markets during the full sample period as well as over the three sub-samples are less than those of developed markets. In emerging markets this average is increasing across the sub-samples, same as the pattern shown in Table 2 for developed markets.

Overall, the sub-period analysis provide insight about the probable reason for non-zero values in Diff column of Table 1 for some considered countries in this research. This analysis suggest that non-zero Diff is not the evidence against the equality of the return with three return components per se but only evidence of lack of enough data available in some periods that slightly distort this relationship.

5. Estimation Results

5.1. Unit Root Tests

The Ordinary Least Square (OLS) estimation method, is based on the assumption that the means and variances of the variables being tested are constant over the time. Variables whose means and variances change over time are known as non-stationary or unit root variables. Therefore, incorporating non-stationary or unit root variables in estimating the regression equations using OLS method gives misleading inferences. The well-known Augmented Dickey-Fuller (1979) test has been used to test for stationarity.

Table 4 shows the results for ADF tests on three decomposed return components series. As reported in this table, earnings growth (ge) and growth in price-earnings ratios (gm) are stationary almost in all countries (except earnings growth (ge) series for Netherland). Dividend-price ratio, however, is not stationary in all countries. A potential reason for that as argued by Perron (1989) might be the existence of structural break in series. Perron (1989) showed that failure to allow for an existing break leads to a bias that reduces the ability to reject a false unit root null hypothesis. To address this issue, Perron proposed allowing for a known or exogenous structural break in the

Augmented Dickey-Fuller (ADF) tests. Thus, next step would be the break point test to find out the possibility of the break in series and the exact date of the break point if there is any.

5.1.1. Unit Root Tests in the presence of Structural Break:

The traditional view of the unit root hypothesis was that the current shocks only have a temporary effect and the long-run movement in the series is unaltered by such shocks. Perron (1989) argues that in the presence of a structural break, the standard ADF tests are biased towards the non-rejection of the null hypothesis. Following Perron (1989, 1997), subsequent equation is used for unit root test with an exogenous break point date. This model considers a one-time break

Table 4: Augmented Dickey-Fuller (ADF) unit root tests.

Note: ge is growth rate of earnings, gm is growth in price-earnings ratio (growth in multiple), and dp is the log of [1+(dividend-price ratio)].Sample period is February 1995 through November 2014.

Developed Countries	ge	gm	dp	Emerging Countries	ge	gm	dp
Australia	I (0)	I (0)	I (0)	Brazil	I (0)	I (0)	I (0)
Austria	I (0)	I (0)	I(1)	Chile	I (0)	I (0)	I (0)
Canada	I (0)	I (0)	I(1)	China	I (0)	I (0)	I (0)
Denmark	I (0)	I(0)	I(1)	Colombia	I (0)	I (0)	I(1)
Finland	I (0)	I (0)	I(1)	Hungary	I (0)	I (0)	I(1)
France	I (0)	I (0)	I (0)	India	I (0)	I (0)	I (0)
Germany	I (0)	I (0)	I (0)	Indonesia	I (0)	I (0)	I (0)
Hong Kong	I (0)	I (0)	I (0)	Korea	I (0)	I (0)	I (0)
Italy	I (0)	I (0)	I(1)	Malaysia	I (0)	I (0)	I (0)
Japan	I (0)	I (0)	I(1)	Mexico	I (0)	I (0)	I(0)
Netherland	I(1)	I (0)	I (0)	Peru	I (0)	I (0)	I(1)
Norway	I (0)	I (0)	I(1)	Philippine	I (0)	I (0)	I (0)
Portugal	I (0)	I (0)	I(1)	Poland	I (0)	I (0)	I(1)
Singapore	I (0)	I (0)	I (0)	Russia	I (0)	I (0)	I(1)
Sweden	I (0)	I (0)	I(1)	South Africa	I (0)	I (0)	I (0)
Switzerland	I (0)	I (0)	I(1)	Taiwan	I (0)	I (0)	I (0)
UK	I (0)	I (0)	I(1)	Thailand	I (0)	I (0)	I (0)
USA	I (0)	I (0)	I(1)	Turkey	I (0)	I (0)	I (0)

in level (intercept) of the trending data.

$$dp_t = a_0 + \beta t + a_1 DU_t(T_b) + a_2 D_t(T_b) + a_3 dp_{t-1} + \sum_{i=1}^{k} \varphi_i \, \Delta dp_{t-i} + u_t$$

where the intercept dummy $DU_t(T_b)$represents a change in the level; $DU_t(T_b)=1$ if (t >T_b) and zero otherwise; the crash dummy $D_t(T_b)$= 1 if t = T_b , and zero otherwise; and T_b is the break date.

To select the break date, Bai and Perron (1998, 2003a) break point test has been applied. Based on this test, we consider a standard multiple linear regression model with T periods and m potential breaks (producing $m + 1$ regimes). The general regression model for the regimes $j = 0, \dots, m$ is,

$$dp_t = Z'_t \delta_j + \varepsilon_t$$

The variables Z have coefficients that are regime specific. To find the break in level, Z is only the intercept. Since we are seeking only one break date to consider as exogenous shock in

Table 5: Bai-Perron breakpoint tests.

Note: This test which is used to find the break point date has been done only for those country's dividend-price ratio (dp) series that show non-stationary properties in initial ADF test. The sample period is from February 1995 through November 2014.

Countries	Bai-Perron break point
Austria	2008M02
Canada	2008M08
Denmark	1997M12
Finland	2008M05
Italy	2002M06
Japan	2008M01
Norway	2008M09
Portugal	2008M06
Sweden	2007M08
Switzerland	2008M01
UK	2008M01
USA	2008M01
Colombia	2004M01
Hungary	2004M05
Mexico	1997M12
Peru	1997M12
Poland	2006M05
Russia	2012M01

break point unit root test, there will be a restriction on pre-specified number of breaks, $m = 1$, and we expect existence of at most two regimes.

Bai and Perron (1998) test for equality of the δ_j across multiple regimes. For a test of the null of no breaks against an alternative of breaks, we employ an F-statistic as in Bai-Perron(2003a) to evaluate the null hypothesis that $\delta_0 = \delta_1$. The statistic should be maximized across the number of breakpoints.

Table 5 shows the results for Bai and Perron (1998, 2003a) break point tests on divided-price ratio series. Note that this test has been done only for those country's dividend-price ratio series that has shown non-stationary properties in the initial ADF test. Interestingly, the break point date for most developed countries are around financial crisis 2007. However, break point dates vary for emerging markets.

Table 6: Breakpoint unit-root tests.

Note: This test has been done only for those country's dividend-price ratio (dp) series that show non-stationary properties in initial ADF test. “t-stat” column reports the Augmented Dickey-Fuller t-statistics for the unit root tests. P-values are Vogelsang’s asymptotic p-values.

Countries	Break Point	t-stat	p-values	Lags	Result
Austria	2008M02	-4.439	< 0.01	0	I (0)
Canada	2008M08	-3.744	< 0.05	14	I (0)
Denmark	1997M12	-3.972	< 0.05	10	I (0)
Finland	2008M05	-3.688	< 0.05	8	I (0)
Italy	2002M06	-3.687	< 0.10	4	I (0)
Japan	2008M01	-4.641	< 0.01	10	I (0)
Norway	2008M09	-3.434	< 0.10	8	I (0)
Portugal	2008M06	-3.368	< 0.10	13	I (0)
Sweden	2007M08	-4.738	< 0.01	12	I (0)
Switzerland	2008M01	-4.107	< 0.025	1	I (0)
UK	2008M01	-3.479	< 0.10	4	I (0)
USA	2008M01	-2.925	< 0.10	6	I (0)
Colombia	2004M01	-3.119	< 0.10	7	I(0)
Hungary	2008M08	-5.241	< 0.01	4	I(0)
Mexico	1997M12	-3.587	< 0.10	9	I (0)
Peru	1997M12	-3.843	< 0.05	11	I (0)
Poland	2006M05	-3.642	< 0.10	6	I (0)
Russia	2012M01	-4.521	< 0.01	1	I (0)

Bai and Perron (1998, 2003a) breakpoint test for earnings growth series of Netherland identifies a break point in the series around 2009M03 (not reported). The break date obtained from Bai and Perron (1998, 2003a) test then used in unit root test with a break point. The result is stationary earnings growth in Netherland after controlling for break point date (not reported).

In order to do the breakpoint unit-root test, we let the model select one potential break point date that minimize the Dickey-Fuller t-statistic. This method select the date providing the most evidence against the null hypothesis of a unit root and in favor of the breaking trend alternative hypothesis. Table 6 reports the results for perron (1998)'s breakpoint unit-root tests which allow for intercept to be vary before and after the break date. The results show that all series are stationary after controlling for potential break point date.

5.2. In-sample return components predictability

Table 7 and Table 8 report the in-sample predictability of growth in Price-earnings ratio (Panel A) and earnings growth (Panel B) at the 1-month horizon for developed and emerging countries respectively. There are nine predictors that are used to predict the return components. In-sample predictability tests consist of regressions of one period ahead return components on current predictor variables. The values reported are the R-squared from regression in percentage that estimated over the full sample period. The sample period is from February 1995 through November 2014. In-sample predictability of the considered financial variables for sum-of-the-parts return components show mixed performance across countries. Panel A in Table 7 shows better in-sample predictability of growth in price-earnings ratio using payout ratio, price-to-EBITDA ratio, and growth in market capitalization, and growth in trading volume. Panel A in Table 8 shows that predictability of the price-earnings ratio by financial variables in emerging countries is much broader than developed countries. The remarkable predictability has been shown by payout ratio, price-to-book ratio, ROE, growth in operating profit, and price-to-EBITDA ratio. Panel B in Table 7 shows payout ratio and price-to-EBITDA ratio perform well in predicting earnings growth for developed countries over the full sample period analysis. Panel B in Table 8 shows more variables with strong in-sample predictability for earnings growth across emerging countries. Payout ratio, price-to-book ratio, price-to-EBITDA, and growth in market capitalization perform well in predicting earnings growth in sample.

Overall, our results suggest that there are 1-month horizon return components predictability using financial variables across wide range of developed and emerging markets.

Table 7: In-sample predictability of growth in Price-earnings ratio (gm) and earnings growth (ge) for developed countries.

Note: This table reports the in-sample predictability of growth in Price-earnings ratio (Panel A) and earnings growth (Panel B) at the 1-month horizon. In-sample predictability tests consist of regressions of one period ahead stock returns on current predictor variables. The values show the R-squared from regression in percentage. The in-sample R-squared values are estimated over the full sample period. The sample period is from February 1995 to November 2014. Asterisks denote significance of the in-sample regression as measured by the F-statistic. The financial variables are used to predict return components are payout ratio ($payout$), growth in payout ratio ($Payoutgw$), price to book ratio (P/B), return on equity (ROE), growth in return on equity ($ROEgw$), growth in operating profit ($EBITgw$), price to earnings before interest, taxes, depreciation, and amortization ratio($P/EBITDA$), growth in market capitalization($Marcapgw$), and growth in trading volume ($Volgw$).

Panel A: Growth in price-earnings ratio (gm)

Country Names	***Payout***	***Payoutgw***	***P/B***	***ROE***	***ROEgw***	***EBITgw***	***P/EBITDA***	***Marcapgw***	***Volgw***
Australia	1.132	0.702	0.146	0.012	0.650	0.171	1.646*	0.661	0.072
Austria	1.491	0.022	0.102	1.788**	1.126	0.032	0.007	0.616	0.002
Canada	1.532	0.071	0.957	0.035	0.140	0.036	0.479	2.326*	0.053
Denmark	0.006	0.009	0.002	0.020	0.405	0.010	0.065	0.000	1.181
Finland	0.001	0.023	0.216	0.093	0.000	0.079	0.538	0.060	2.785**
France	0.054	0.010	0.208	0.037	0.020	0.002	0.345	0.061	0.295
Germany	0.278	0.184	0.015	0.063	0.410	0.016	0.037	0.025	0.646
Hong Kong	0.025	0.038	7.313**	0.143	0.043	0.002	8.893*	0.464	0.001
Italy	0.100	0.160	0.140	0.202	0.803	0.341	0.323	0.977	0.050
Japan	4.002**	0.482	0.094	0.157	0.891	0.199	0.496	0.040	0.002
Netherlands	0.024	0.047	0.225	0.045	0.070	0.014	0.014	1.223	0.520
Norway	0.002	0.000	0.001	0.001	0.049	0.107	0.431	0.154	0.001
Portugal	0.098	0.220	0.906	0.301	0.436	0.002	0.140	0.207	0.094
Singapore	0.713	0.118	0.005	0.567	0.015	0.017	4.899**	0.235	1.742**
Sweden	25.339**	0.003	0.189	0.098	0.001	0.020	0.161	0.103	0.448
Switzerland	0.023	0.006	0.055	0.019	0.027	0.002	0.052	2.204**	0.002
UK	0.685	0.142	0.569	0.071	0.252	0.051	1.038	2.003**	0.063
USA	0.886	0.982	0.206	1.056	0.718	0.477	0.005	0.185	0.205

Table 7: (Cont.) In-sample predictability of growth in Price-earnings ratio (gm) and earnings growth (ge) for developed countries.

Panel B: Growth in earnings (ge)

Country Names	***Payout***	***Payoutgw***	***P/B***	***ROE***	***ROEgw***	***EBITgw***	***P/EBITDA***	***Marcapgw***	***Volgw***
Australia	0.684	0.224	0.094	0.007	0.426	0.075	1.066	0.436	0.046
Austria	1.238	0.008	0.014	1.069	1.126	0.000	0.165	0.013	0.143
Canada	2.642**	0.026	0.003	0.002	0.578	0.009	0.238	0.059	0.382
Denmark	0.290	0.009	0.030	1.476	0.219	0.091	0.035	0.875	0.410
Finland	0.000	0.001	0.322	0.000	0.019	0.191	0.191	0.158	2.097**
France	0.003	0.001	0.025	0.002	0.000	0.003	0.028	0.000	0.080
Germany	0.032	0.031	0.000	0.057	0.004	0.017	0.004	0.072	0.361
Hong Kong	0.027	0.015	4.783**	0.013	0.004	0.014	5.936**	0.864	0.683
Italy	0.009	0.056	0.035	0.003	1.002	0.034	0.229	0.308	0.008
Japan	3.262**	0.549	0.326	0.050	0.542	0.024	0.593	0.229	0.000
Netherlands	0.001	0.004	0.279	0.010	0.000	0.009	0.135	1.320	0.754
Norway	0.004	0.022	0.001	0.000	0.001	0.025	0.001	0.093	0.008
Portugal	0.657	0.005	0.131	0.018	0.046	0.027	0.004	0.088	0.561
Singapore	0.007	0.712	0.044	0.012	1.081	0.886	5.944**	0.125	1.168
Sweden	18.530**	0.020	0.031	0.001	0.002	0.013	0.016	0.044	0.416
Switzerland	0.001	0.012	0.219	0.035	0.018	0.087	0.137	0.567	0.058
UK	0.278	0.051	0.582	0.004	0.041	0.000	1.279	1.734**	0.000
USA	0.055	0.133	3.389**	0.125	0.065	0.053	2.112**	2.790**	0.005

Table 8: In-sample predictability of growth in Price-earnings ratio (gm) and earnings growth (ge) for emerging countries.

Note: This table reports the in-sample predictability of growth in Price-earnings ratio (Panel A) and earnings growth (Panel B) at the 1-month horizon. In-sample predictability tests consist of regressions of one period ahead stock returns on current predictor variables. The values show the R-squared from regression in percentage. The in-sample R-squared values are estimated over the full sample period. The sample period is from February 1995 to November 2014. Asterisks denote significance of the in-sample regression as measured by the F-statistic. The financial variables are used to predict return components are payout ratio ($payout$), growth in payout ratio ($Payoutgw$), price to book ratio (P/B), return on equity (ROE), growth in return on equity ($ROEgw$), growth in operating profit ($EBITgw$), price to earnings before interest, taxes, depreciation, and amortization ratio($P/EBITDA$), growth in market capitalization($Marcapgw$), and growth in trading volume ($Volgw$).

Panel A: Growth in price-earnings ratio (gm)

Country Names	*Payout*	*Payoutgw*	*P/B*	*ROE*	*ROEgw*	*EBITgw*	*P/EBITDA*	*Marcapgw*	*Volgw*
Brazil	0.004	0.003	4.891**	0.082	0.305	0.014	9.603	0.143	0.286
Chile	0.113	0.125	0.101	3.637**	0.060	4.650**	0.378	0.292	0.029
China	0.233	0.158	0.036	0.290	0.485	0.338	4.136**	0.042	0.698
Colombia	5.952**	3.504**	0.089	2.638**	6.667**	5.012**	0.552	0.349	0.922
Hungary	0.027	0.019	2.451**	0.029	0.134	0.032	1.602**	0.005	0.223
India	0.010	0.004	1.985**	0.551	0.499	1.890**	6.731	0.037	0.048
Indonesia	8.279**	0.152	0.232	0.324	0.498	0.057	1.238	0.392	0.015
Korea	1.959**	0.062	0.396	0.230	0.241	0.036	0.290	0.345	1.430
Malaysia	1.008	0.177	0.365	3.279**	0.177	0.029	0.524	0.564	0.040
Mexico	0.034	0.000	0.794	0.195	0.170	0.004	2.708**	0.538	0.030
Peru	0.003	0.017	0.315	0.226	0.005	0.153	0.412	2.086**	0.066
Philippines	0.002	0.030	0.028	2.823**	22.843**	10.393**	0.000	4.204**	0.833
Poland	8.846**	0.517	2.389**	0.756	0.351	0.210	1.138	1.085	0.019
Russia	0.003	0.020	0.006	0.038	1.420	0.048	0.013	1.146	0.240
South Africa	0.054	0.000	0.002	0.107	0.169	0.034	1.035	0.060	1.349
Taiwan	6.553**	0.522	1.622**	0.259	1.246	0.046	1.333	0.341	1.332
Thailand	3.054**	0.169	0.032	0.758	1.354	0.106	0.502	0.935	0.841
Turkey	0.042	0.000	5.288**	0.024	0.170	0.141	5.035**	0.455	0.246

Table 8 :(Cont.) In-sample predictability of growth in Price-earnings ratio (gm) and earnings growth (ge) for emerging countries.

Panel B: Growth in earnings (ge)

Country Names	***Payout***	***Payoutgw***	***P/B***	***ROE***	***ROEgw***	***EBITgw***	***P/EBITDA***	***Marcapgw***	***Volgw***
Brazil	0.034	0.046	6.191**	0.021	0.000	0.106	9.464**	1.355	0.050
Chile	0.000	0.000	1.400	2.827**	0.003	4.013**	2.424**	1.671**	0.037
China	0.145	0.111	0.146	0.017	0.014	0.043	1.585	0.157	0.199
Colombia	0.413	0.438	0.136	0.344	0.980	0.709	0.000	0.054	0.654
Hungary	3.196**	0.106	2.361**	0.001	0.012	0.016	3.823**	0.447	0.017
India	1.973**	0.083	4.770**	0.006	0.000	4.634**	5.766**	0.127	0.027
Indonesia	8.972**	0.001	0.209	3.311**	0.485	2.926**	1.491	0.480	0.022
Korea	1.526	0.085	2.217**	0.007	0.120	0.031	1.186	3.091**	0.448
Malaysia	0.005	0.000	2.115**	5.758**	4.565**	0.102	2.340**	2.655**	0.211
Mexico	0.010	0.000	0.341	0.143	0.145	0.076	5.823**	7.087**	0.116
Peru	0.037	0.027	0.452	0.002	0.001	0.001	0.421	2.593**	0.015
Philippines	0.012	0.000	0.379	0.001	0.000	0.221	0.692	0.525	0.021
Poland	10.171**	0.101	0.633	0.078	0.149	0.006	0.345	0.946	0.025
Russia	0.020	0.126	0.087	0.089	1.659**	0.002	1.474	0.057	0.430
South Africa	0.122	0.089	0.122	0.004	0.011	0.400	0.061	0.300	0.292
Taiwan	9.574**	1.349	0.635	0.797	2.419**	0.000	0.774	0.273	1.905**
Thailand	3.813**	0.012	0.311	0.033	0.033	0.102	0.595	0.408	1.848**
Turkey	0.043	0.067	5.876**	0.005	0.070	0.001	5.055**	0.792	0.006

5.3. Out-of-sample return components forecasting

In this section we consider out-of-sample forecastability of the return components, 1-month ahead from February 2005 through November 2014. The aim of this test is to find out whether financial variables are able to beat the historical average in real time to forecast return components in which we will use in predicting stock return in next stage when we form the sum-of the-parts forecast model. We try to find out whether investor could actually utilize regression models in order to benefit from more accurate predictions of future stock return components. This issue is of importance to both practitioners and academics since forecast of return components will be used to forecast stock return later on when we consider sum-of-the-parts technique. Asset managers, economic policy makers, as well as pension providers and contributors all need accurate estimates of future market returns.

Understanding the forecast performance of the financial variables for decomposed return components is the key in selecting the best variables that performs well out-of-sample for each component. We examine a range of financial ratios for a wide range of developed and emerging countries. The historical average of return components has been used as the benchmark in our analysis to find the best variables that provide more accurate return components forecasts. The variables selected from this step will be used in next step to form the sum-of-the-parts forecast model.

Table 9 and Table 10 report the out-of-sample R-squared (OOS-R^2) in percentage points for growth in Price-earnings ratio (Panel A) and earnings growth (Panel B) for developed and emerging markets respectively.

The OOS-R^2 provides the percentage by which the regression model beats the historical average benchmark. Statistical inference is based on McCracken's (2007) MSE-F test, which assesses if the forecast error from the regression model is smaller than the forecast error from the historical average regression. Critical values are based on a bootstrap procedure under the null hypothesis of equal forecast accuracy.

Table 9 shows the superior out-of-sample performance of the financial variables in forecasting return components. Panel A shows that all the considered financial variables except growth in operating profit performs well out-of-sample in forecasting growth in price-earnings ratio. Similarly, Panel B shows that considered financial variables with exception of ROE forecast growth in earnings better than historical average benchmark. Although reported OOS R^2 are

Table 9: Out-of-sample 1-month ahead forecasts of growth in price-earnings ratio (gm) and earnings growth (ge) from February 2005 to November 2014 for developed countries.

Notes: This table reports the out-of-sample R-squared (OOS R^2) in percentage points. OOS R^2shows the percentage by which the regression model beats the historical average benchmark. Statistical inference is based on McCracken's (2007) MSE-F test, which assesses if the forecast error from the regression model is smaller than the forecast error from the historical average regression. Critical values are based on a bootstrap procedure under the null hypothesis of equal forecast accuracy. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels respectively for a one-sided test. The financial variables are used to forecast return components are payout ratio ($payout$), growth in payout ratio ($Payoutgw$), price to book ratio (P/B), return on equity (ROE), growth in return on equity ($ROEgw$), growth in operating profit ($EBITgw$), price to earnings before interest, taxes, depreciation, and amortization ratio ($P/EBITDA$), growth in market capitalization ($Marcapgw$), and growth in trading volume ($Volgw$).

Panel A: Growth in price-earnings ratio (gm)

Country Names	*Payout*	*Payoutgw*	*P/B*	*ROE*	*ROEgw*	*EBITgw*	*P/EBITDA*	*Marcapgw*	*Volgw*
Australia	15.92**	16.07**	-1.43	-0.19	-0.05	0.05	1.88**	0.09	-0.41
Austria	-160.94	-3.39	-1.17	0.22	0.69*	-0.02	0.13	-20.52	-0.01
Canada	-6.61	-0.30	1.23**	-0.32	0.13	-0.08	0.32*	-0.21	-2.78
Denmark	-523.15	-0.06	-1.36	-2.13	0.44*	-0.06	-0.13	0.86*	1.13**
Finland	-227.04	-4.00	0.10	0.05	-2.24	-0.09	0.07	-10.73	0.85*
France	-0.12	-0.31	-0.96	-0.54	-0.33	-0.32	-0.62	-1.32	2.12**
Germany	-3.11	-0.16	0.02	0.08	0.10	-0.76	0.04	-0.49	1.05*
Hong Kong	0.01	0.03	5.54***	-0.13	0.05	-0.15	-7.19	-3.95	-0.26
Italy	40.18***	41.22***	0.03	0.03	5.60***	0.08	0.71*	0.20	0.04
Japan	-21.63	1.75**	-5.40	-10.47	-6.14	-3.91	-14.70	-0.58	-3.35
Netherlands	-3.84	-3.62	-0.43	-0.01	-0.82	-0.01	-0.35	-7.93	0.09
Norway	-2.56	-1.66	-1.81	-2.23	-0.31	-1.11	1.84**	-14.05	-0.20
Portugal	0.09	0.30*	0.69*	-0.90	-9.65	-0.25	-0.04	2.51**	-9.55
Singapore	-1.01	-1.43	-0.30	-0.78	-0.36	-0.07	2.32**	0.46*	-15.22
Sweden	-145.13	-1.77	0.34*	-3.46	-1.55	-7.55	0.38*	-94.04	-13.52
Switzerland	-0.05	-0.04	-0.33	-0.13	-0.10	0.00	-0.44	1.81**	-1.68
UK	-0.04	-0.09	0.36*	0.01	0.00	0.00	0.58*	-0.30	1.85**
USA	-0.01	0.23	-0.02	0.96*	-0.32	0.18	-0.80	0.02	-0.35

Table 9 :(Cont.) Out-of-sample 1-month ahead forecasts of growth in price-earnings ratio (gm) and earnings growth (ge) from February 2005 to November 2014 for developed countries.

Panel B: Growth in earnings (ge)

Country Names	***Payout***	***Payoutgw***	***P/B***	***ROE***	***ROEgw***	***EBITgw***	***P/EBITDA***	***Marcapgw***	***Volgw***
Australia	13.31**	13.67**	0.14	0.01	-1.11	0.01	1.05*	-1.51	-0.09
Austria	-187.63	-5.53	-0.20	0.06	-0.22	-0.09	0.10	-23.72	0.08
Canada	-9.11	-2.27	-0.01	-1.07	-7.47	0.03	-3.41	-1.62	-4.96
Denmark	-23.67	-0.95	0.01	0.08	0.01	0.09	0.02	5.70***	0.31*
Finland	-1.89	-1.78	0.03	0.03	-1.74	0.04	-0.04	-13.98	0.88*
France	2.14**	2.15**	-0.52	-0.06	-0.05	0.06	-0.19	-0.04	0.24
Germany	0.06	0.25	-0.30	-0.30	-0.03	0.04	-0.71	-6.16	0.61*
Hong Kong	0.88*	0.84*	3.61***	-0.05	0.08	0.00	-1.75	-3.90	-1.13
Italy	56.11***	56.76***	-0.02	-0.04	4.32***	-0.32	0.89*	1.45**	0.00
Japan	69.57***	71.17***	1.51**	-0.37	-5.30	-0.13	2.06**	1.09*	-0.80
Netherlands	-2.48	-2.48	-0.24	0.00	-1.75	0.01	-0.09	-2.80	0.28
Norway	-5.88	-1.27	-0.13	-0.07	0.00	-0.38	-1.52	-19.86	0.04
Portugal	0.47*	-0.11	0.11	-3.25	0.55*	0.52*	-0.73	0.82*	-3.36
Singapore	-3.51	-3.12	-0.16	-3.79	-1.44	-1.01	7.26	-0.68	-9.20
Sweden	-82.54	-1.01	-1.19	-0.50	-1.49	-1.75	-0.63	-67.77	-13.24
Switzerland	-0.06	-0.02	-1.02	0.00	-0.05	0.12	-0.26	0.53*	-2.69
UK	-1.48	-1.39	0.44*	-0.01	-0.05	-0.09	-0.37	0.59*	-0.98
USA	-0.10	-0.18	2.39**	-0.37	-0.19	-0.13	1.46**	1.99**	-0.07

Table 10: Out-of-sample 1-month ahead forecasts of growth in price-earnings ratio (gm) and earnings growth (ge) from February 2005 to November 2014 for emerging countries.

Notes: This table reports the out-of-sample R-squared (OOS R^2) in percentage points. OOS R^2shows the percentage by which the regression model beats the historical average benchmark. Statistical inference is based on McCracken's (2007) MSE-F test, which assesses if the forecast error from the regression model is smaller than the forecast error from the historical average regression. Critical values are based on a bootstrap procedure under the null hypothesis of equal forecast accuracy. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels respectively for a one-sided test. The financial variables are used to forecast return components are payout ratio ($payout$), growth in payout ratio ($Payoutgw$), price to book ratio (P/B), return on equity (ROE), growth in return on equity ($ROEgw$), growth in operating profit ($EBITgw$), price to earnings before interest, taxes, depreciation, and amortization ratio ($P/EBITDA$), growth in market capitalization ($Marcapgw$), and growth in trading volume ($Volgw$).

Panel A: Growth in price-earnings ratio (gm)

Country Names	***Payout***	***Payoutgw***	***P/B***	***ROE***	***ROEgw***	***EBITgw***	***P/EBITDA***	***Marcapgw***	***Volgw***
Brazil	-0.22	-0.21	-182.54	-2.11	-0.65	0.07	1.72**	-1.78	1.39**
Chile	18.86***	19.24***	-1.45	-18.98	-7.50	-27.18	-11.64	-3.41	-5.72
China	-5.02	0.55*	-0.44	-1.31	-0.28	0.38*	4.99***	-0.24	0.39*
Colombia	-6.90	-12.48	-0.77	-3.49	-0.87	-3.17	-6.28	-11.84	-4.20
Hungary	-11.48	-13.58	3.55***	-2.71	-4.85	-1.08	2.29**	-2.16	-4.81
India	-1.40	-1.63	-4.31	-2.29	-1.21	-4.13	0.73*	-1.98	0.64*
Indonesia	-88.82	-1.68	-98.35	-5.29	1.85**	-7.78	-69.74	-12.56	-0.82
Korea	-7.39	0.10	0.04	0.81*	0.62*	0.08	0.99*	0.14	-1.60
Malaysia	0.44*	-0.20	-1.95	0.58*	0.98*	-1.43	-3.19	-2.30	-1.03
Mexico	0.24	0.23	-0.41	0.03	0.51*	-0.18	-2.90	-1.51	-0.97
Peru	-5.37	-5.00	-0.56	-1.67	-0.51	-1.77	0.67*	1.31**	-3.03
Philippines	-2.00	-2.17	-0.63	-8.28	-10.82	-4.99	-1.75	-43.54	0.21*
Poland	-0.73	-4.28	1.33**	-6.09	0.07	0.19	-0.07	-3.65	-0.31
Russia	-1.75	1.44	-1.54	-3.44	-32.11	-1.35	0.03	7.18**	-63.30
South Africa	-1.33	-1.05	-0.39	-1.57	-1.62	-0.72	-16.72	0.14	2.79***
Taiwan	-31.95	-1.12	1.18**	0.23	-4.15	-0.57	0.52*	0.24	0.67*
Thailand	-128.54	-12.84	-2.12	-2.58	-6.29	-1.32	0.56*	0.46*	-4.13
Turkey	2.02**	2.31**	-29.28	-0.06	0.67*	0.38*	-24.21	-2.38	-7.50

Table 10 :(Cont.) Out-of-sample 1-month ahead forecasts of growth in price-earnings ratio (gm) and earnings growth (ge) from February 2005 to November 2014 for emerging countries.

Panel B: Growth in earnings (ge)

Country Names	***Payout***	***Payoutgw***	***P/B***	***ROE***	***ROEgw***	***EBITgw***	***P/EBITDA***	***Marcapgw***	***Volgw***
Brazil	-0.14	-0.12	-440.82	-0.35	-1.27	-1.27	-20.02	0.08	-1.93
Chile	21.80***	21.76***	-1058.34	-88.56	-72.42	-142.21	-624.96	-399.67	-2.09
China	-20.11	4.74***	1.54*	4.12***	4.49***	4.11***	6.48***	3.65***	3.87***
Colombia	37.55***	35.05***	-2.64	-0.78	-5.92	-2.86	-9.98	-20.54	-1.78
Hungary	-8.24	-13.71	-9.66	-0.49	-1.27	-1.69	4.49***	1.43**	-0.41
India	-17.88	-0.84	-14.23	-1.22	-0.50	-2.07	2.74***	-0.19	-0.88
Indonesia	-95.22	57.21***	50.21***	32.55***	-13.98	14.44***	-64.49	-7.98	-9.75
Korea	-12.64	0.41*	-4.89	-0.27	0.08	-0.16	-8.48	-0.73	0.07
Malaysia	29.82***	29.57***	-2.36	24.58***	11.54***	-1.89	-0.19	-2.99	-0.78
Mexico	0.70*	0.87*	-12.46	-0.30	-0.30	-1.30	5.16***	6.25***	-0.03
Peru	-3.15	-3.22	-0.95	0.00	0.04	-1.54	-0.38	-0.02	-1.35
Philippines	-6.40	-6.02	-11.71	-0.42	0.00	-1.92	-16.02	-5.76	-2.19
Poland	2.68***	-2.65	0.86*	-0.94	0.41*	-0.03	-0.17	-3.17	-1.23
Russia	-6.60	-3.63	1.58**	-6.16	-46.22	-0.64	3.01***	-9.58	-92.88
SouthAfrica	7.48***	-0.23	0.15	-0.15	-0.17	-0.15	-1.76	-0.03	0.11
Taiwan	-50.32	-0.84	0.41*	0.60*	-4.25	-0.77	0.55*	0.18	1.27**
Thailand	-136.32	-29.35	-4.90	0.46	-1.19	-0.39	-0.99	-1.35	-9.13
Turkey	1.19*	1.07*	9.75***	-0.19	-1.05	0.53*	-6.28	0.13	-0.05

positive in many countries for growth in operating profit and ROE in forecasting growth in price-earnings ratio and earnings growth respectively , they are not statistically significant using the McCracken's (2007) MSE-F test. This statistic test under the null that the regression forecast is not better than the benchmark. The MSE-F statistics for considered financial variables are statistically significant at the 5% level in majority of the developed countries indicating that the regression forecast mean-squared error is statistically smaller than the benchmark.

Table 10 shows that financial variables exhibit superior performance in forecasting growth in price-earnings ratio explicitly in Brazil, Chile, China, Hungary, Indonesia, Peru , Poland , Russia, South Africa, Taiwan, and Turkey as reported in Panel A. This Panel also shows that the variables that link to the market expectations performs well in predicting growth in price-earnings ratio out-of-sample.

Panel B in Table 10 is dominated by financial variables that strongly beat the historical average benchmark. This panel clearly shows that financial variables perform remarkably out-of-sample in forecasting growth in earnings. There are several countries in this group that exhibit better forecastability of the earnings growth by financial variables than the others including China, Indonesia, and Malaysia as reported in Panel A. There are 8 out of 9 financial variables considered in this research that forecast growth in earnings in China significantly better than the historical sample mean.

Overall the MSE-F statistics for most of the financial variables are statistically significant at the 5% or 10% levels in majority of the emerging markets, as shown by the asterisks in Table 10 indicating that the regression forecast mean-squared error is statistically smaller than the benchmark.

In line with findings by S.J. Jordan et al. (2014) in predictability power of the payout ratio, we found superior performance of this variable in forecasting return components in many countries in both groups of developed and emerging countries.

Overall, the out-of-sample forecast results confirm and support our in-sample findings. There is strong evidence of out-of-sample forecastability of decomposed return components with financial variables.

5.4. Sum-of-the-parts model comparisons

We perform an out-of-sample forecasting exercise along the lines of Ferreira and Santa Clara (2011) to investigate the performance of the sum-of-the-parts technique using financial variables as predictors of the return components. In the first stage, growth in price-earnings ratio and earnings growth are forecasted using a list of financial variables. Then, the predictive variables for each return component would be selected based on the magnitude and significance of the OOS R-squared. This statistic shows the outperformance of the predictive variable compared to historical benchmark. The last component of sum-of-the-parts method which is dividend-price ratio (dp_t) is highly persistent, as shown in Table 11. As reported in this table, AR (1) coefficients are greater than 0.90 in almost all countries. Thus, the expected dividend-price ratio is estimated by the current value of dividend-price ratio (the log of 1+dividend-price ratio).

Ultimately, we substitute return components fitted values in equation (6) to forecast stock return. Table 12 reports the forecasts of stock return across developed and emerging markets and compares three models of sum-of-the-parts (SOP). Model 1 is sum-of-the-parts model that incorporates financial variables to forecast return components, Model 2 is the sum-of-the-parts introduced by Ferreira and Santa-Clara (2011), hereafter SOP-FS, and Model 3 is the simple version of the SOP without growth in price-earnings ratio component. The values reported are out-of-sample R-squared in percentage for stock market return forecasts at monthly frequency. The out-of-sample R-squared statistics compare the forecast error of the model with the forecast error of the historical mean. Forecast window is from February 2005 through November 2014. Generally, the results show a significant improvement in forecastability of the stock returns across countries by incorporating financial variables in sum-of-the-parts method.

Panel A in Table 12 shows that SOP method with financial variables performs remarkably well on data from all developed countries with the exception of Norway, UK, and Germany. The reported OOS R-squared statistics in Germany is positive, although it is not statistically significant based on the MSE-F statistic of McCracken (2007). However, the OOS R^2 are negative for Norway and UK indicating that the SOP method with financial variables is not able to beat the historical average benchmark in forecasting stock market return in these two countries.

This Panel also shows that Model 2 (SOP-SF) performs well in a few developed countries including Canada, France, Hong Kong, Netherland, Portugal, and US. Our results are in line with Ferreira and Santa-Clara (2011) for US and consistent with McMillan and Whohar (2011) for Japan, Canada, and France but not for Italy and UK.

The results from Model 3 which is the simple version of the SOP without growth in price-earnings

Table 11: Persistency of the dividend-price ratio **(**dp_t)

Note: This table reports summary statistics and persistency of dividend-price ratio as measured by AR(1) coefficient. AR(1) coefficients reported in this table show a highly persistency of the dividednd-price ratio across all countries. Values associate with means and standard deviations are shown in percentage. The sample period is from February 1995 through November 2014.

Country Name	***dp***			***Country Name***	***dp***		
	Mean%	***Std%***	***AR(1)***		***Mean%***	***Std%***	***AR(1)***
Panel A:Developed Countries				*Panel B : Emerging Countries*			
Australia	0.44	0.08	0.97	Brazil	0.22	0.10	0.93
Austria	0.21	0.09	0.94	Chile	0.22	0.06	0.93
Canada	0.18	0.05	0.98	China	0.21	0.06	0.87
Denmark	0.15	0.06	0.90	Colombia	0.28	0.12	0.96
Finland	0.24	0.14	0.97	Hungary	0.16	0.08	0.95
France	0.24	0.08	0.94	India	0.12	0.03	0.90
Germany	0.22	0.07	0.95	Indonesia	0.21	0.07	0.92
Hong Kong	0.30	0.08	0.92	Korea	0.14	0.04	0.90
Italy	0.28	0.13	0.96	Malaysia	0.26	0.08	0.96
Japan	0.11	0.05	0.99	Mexico	0.14	0.04	0.87
Netherlands	0.26	0.08	0.91	Peru	0.26	0.11	0.91
Norway	0.26	0.10	0.96	Philippines	0.19	0.09	0.97
Portugal	0.31	0.16	0.95	Poland	0.20	0.13	0.98
Singapore	0.26	0.09	0.96	Russia	0.14	0.10	0.97
Sweden	0.22	0.09	0.97	South Africa	0.26	0.05	0.91
Switzerland	0.18	0.06	0.99	Taiwan	0.21	0.14	0.98
UK	0.31	0.07	0.97	Thailand	0.27	0.07	0.95
USA	0.15	0.04	0.97	Turkey	0.20	0.07	0.84

ratio are not reliable in all countries since growth in multiple component is not trivial in other countries than US. The reported OOS R-squared statistics for this method are positive in Canada, Netherland, Portugal, and US.

Panel B reports the stock return forecasts for emerging markets. The results show strong evidence of out-of-sample forecastability of the stock return using sum-of-the-parts with financial variables as predictor for return components. In contrast to SOP-FS which only outperforms the

Table 12: Forecasts of stock market returns.

Note: This table compares three models of sum-of-the-parts (SOP). Model 1 is sum-of-the-parts model that incorporates financial variables to forecast return components, Model 2 is the SOP introduced by Ferreira and Santa-Clara (2011), and Model 3 is the simple version of the SOP without growth in multiple. The values reported are out-of-sample R-squared in percentage for stock market return forecasts at monthly frequency. The out-of-sample R-squared compares the forecast error of the model with the forecast error of the historical mean. Sample period is from February 1995 through November 2014.Forecast window is from February 2005 toward the end of sample period. Asterisks denote significance of the out-of-sample MSE-F statistic of McCracken (2007). ***,**,* denote significance at the 1%, 5%, and 10% level respectively.

	Sum-of-the-parts (SOP)		
Country Names	***Model 1***	***Model 2***	***Model 3***
Panel A : Developed Countries			
Australia	7.302***	-0.201	0.022
Austria	0.553*	-3.015	-6.363
Canada	3.942***	0.439*	0.432*
Denmark	24.852***	0.000	0.045
Finland	3.563***	-0.467	-2.950
France	3.109***	0.780*	-4.049
Germany	0.159	-1.026	-1.843
Hong Kong	1.616**	0.261*	-2.861
Italy	10.136***	-2.274	-11.974
Japan	8.351***	-21.722	-6.676
Netherlands	4.963***	4.866***	4.741***
Norway	-1.035	-1.967	0.034
Portugal	8.379***	7.781***	8.543***
Singapore	0.305*	-10.481	-12.136
Sweden	1.732**	-0.610	-44.170
Switzerland	1.764**	-0.629	-0.023
UK	-2.734	-3.282	-0.252
USA	1.850**	0.291*	0.419*

historical average in six out of eighteen emerging countries, SOP with financial variables shows superior performance compared to historical benchmark in all countries except India, Malaysia, Poland, and Thailand. The SOP with financial variables not only perform well out-of-sample compared to historical average benchmark but also shows better forecasting performance compared to SOP-SF over the sample period considered in this research.

Table 12- (Continued) Forecasts of stock market returns.

	Sum-of-the-parts (SOP)		
Country Names	***Model 1***	***Model 2***	***Model 3***
Panel B : Emerging Countries			
Brazil	0.271*	0.221*	-0.333
Chile	37.895***	-17.978	-16.293
China	1.657**	0.657*	-0.461
Colombia	8.277***	-13.252	-26.689
Hungary	5.294***	2.465**	-1.853
India	-0.191	0.113	0.764*
Indonesia	1.198*	-42.358	-42.888
Korea	1.222*	-0.425	-0.607
Malaysia	-3.967	-35.330	-50.776
Mexico	0.583*	-0.098	-0.343
Peru	1.609**	0.416*	0.209*
Philippines	2.788***	0.336*	6.071***
Poland	-0.239	-0.785	-6.148
Russia	6.817***	-0.771	-0.742
South Africa	0.261*	-1.055	0.070*
Taiwan	0.676*	0.882*	1.055*
Thailand	-12.115	-15.295	3.404***
Turkey	9.367***	-5.316	2.891***

Our results are inconsistent with the findings by McMillan and Wohar (2011) for Korea and Malaysia using Sum-of-the-parts method. We find the superior performance of the SOP with financial variable out-of-sample but return forecasts using SOP-FS method are not able to outperform the historical average in these two countries.

Overall, we find significant improvement in stock return forecasts by incorporating financial variables in predicting the return components in sum-of-the-parts method.

6. Conclusions

This research examines the issue of stock return forecasting by employing the sum-of-the-parts (SOP) modeling technique introduced by Ferreira and Santa-Clara (2011) for developed and emerging financial markets. This method of forecasting shows superior performance where compared with traditional predictive regressions and historical average benchmark as documented in Ferreira and Santa Clara (2011). We incorporate financial variables into the SOP model to improve forecasting stock returns. In this approach, each return component is forecasted separately by a list of financial variables, and then fitted values from the best estimators according to out-of-sample performance of the predictors are used in next step in the forecast model. We conduct a series of one-step ahead recursive forecasts for a wide range of developed and emerging markets over the period February 1995 through November 2014.The forecast window is from February 2005 toward the end of sample period.

The findings show that SOP method with financial variables performs better than the historical sample mean in out-of-sample comparisons. This approach not only beats the historical average benchmark in most countries considered in this research, but also shows improvement in forecasting using SOP-FS modeling technique. In line with McMillan and Wohar (2011), we find that SOP-FS performs well in many countries but the evidence is not worldwide.

We conclude that generally there is significant predictability in stock return and that it would have been possible to profitably time the market by considering the aggregate financial variables in sum-of-the-parts forecast model.

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CHAPTER 2

Equity Premium Predictability under Regime Shifts: International Evidence

1. Introduction

Equity premium forecasting has attracted great attentions among both academics and practitioners in finance. Many studies find evidence in favor of equity returns predictability in sample (see Fama and French (1988) and Campbell and Shiller (1988), Cochran (2008, 2011) among many others). Although stock returns are predictable, they contain a sizable unpredictable component, so that the best forecasting model can explain only a relatively small portion of stock returns. It is argued that even small return predictability signals economically significant return predictability (e.g., Xu (2004), Kandel and Stambaugh (1996), Campbell and Thompson (2008)). Numerous financial and economic variables including valuation ratios, such as the dividend–price, earnings–price, and book-to-market, as well as nominal interest rates, the inflation rate, term and default spreads have been proposed as predictors of stock returns in the literature. (Fama and French 1989,; Ang and Bekaert 2007, among many others). The early contributions to equity premium predictability mainly focused on the in-sample predictive ability of the potential predictors and the development of proper econometric techniques for valid inference. Lately, interest has turned to the out-of-sample performance of the candidate variables. Out-of-sample, however, little consensus exists on the fundamental questions of whether predictability exists and which variables have the best predictive performance (see, for example, Goyal and Welch, 2008; Campbell and Thompson, 2008; Rapach, Strauss, and Zhou, 2013).Some studies such as Goyal and Welch (2008) show that common return predictors fail to outperform the historical average benchmark forecast in out-of-sample tests. Recently, the literature reveals that the magnitude of return predictability is distinctly time-varying and unstable. For example, Henkel et al. (2011) show that the short-horizon performance of return predictors varies across business cycles. The counter-cyclical predictability documents significant predictability only in the contraction regime.

With documented time-variation in coefficients in the literature, the issue of equity premium predictability conducted within the linear regression framework is still questionable. However, recent contributions to the literature have pointed out that the relationship between returns and predictors is not linear and several approaches have been proposed to capture this non linearity. Markov-switching models are among the most popular models for forecasting stock returns (Guidolin and Timmermann, 2007; Henkel et al., 2011). Forecasting strategies based on the regime shifts deliver statistically and economically significant out-of-sample gains relative to the historical average benchmark by accommodating model uncertainty and parameter instability. (Henkel et al., 2011, Dangl and Halling, 2012).

Dividend-price ratio is among the most popular predictor of aggregate equity premium.[1] Since Campbell and Shiller (1988), enormous number of research documents evidence that the dividend-price ratio predicts future stock returns. For example Cochrane (2008) find the evidence in favor of the return predictability but not dividend growth predictability using joint distribution of dividend-price ratio coefficients in return and dividend growth regressions. Similarly, Chen (2009) finds that predictive power of dividend-price ratio for stock returns and dividend growth depends on the sample periods. He finds that post-world War II, there is strong evidence of return predictability but not the dividend growth predictability using dividend-price ratio as predictor. Engsted and Pederson (2010) show that predictability is not only sensitive to the choice of sample period but also whether we consider nominal return, real or excess return. They find that excess returns and real returns are predictable in the US after World War II by dividend-price ratio but not the nominal returns. They show that dividend-price ratio predictability of the stock returns differs over time and across countries. In line with their findings, Park (2010) argues that the ability of the dividend-price ratio to predict stock returns differs greatly over time and between countries, and depends on its persistence.

Two econometric concerns with predictive regression have been a recent focus of attention. The firs issue addresses the features of OLS estimator and the second associates with the oversizing in the conventional t-test of the null of no predictability. In the first concern which is primarily discussed by Stambaugh (1999), the bias arises when the predictor is highly persistent and the predictor and return innovations are correlated. His findings suggest that there would be much less

[1](Rozeff, 1984; Campbell and Shiller, 1988a, 1998; Fama and French, 1988, 1989; ochrane, 2008; Lettauand Van Nieuwerburgh, 2008; Pástor and Stambaugh, 2009).

predictability once the estimators are adjusted for this bias. Second, for a predictor with unit root, the limit distribution of the t-test statistic is right skewed (Phillips, 2014). Hence, the null hypothesis of no predictability is often rejected when one uses critical values from a symmetric t-distribution even when the null hypothesis is correct. This explains oversizing in the standard t-test. The likelihood ratio test (LRT) also suffers from oversizing, because the LRT statistic is approximately the squared t-test under some regularity conditions (Chen and Deo, 2009a).

To address these issues we modify the predictor so that it is less persistent with similar features as dividend-price ratio. Cornell (2013) shows that historical experience is important in the relationship of the dividend-price ratio and future equity returns. Thus, we introduce a modified dividend-price ratio with dividend-price ratio in numerator and average of three-month of this ratio in the denominator. This ratio captures the shocks to the current period dividend-price ratio relative to a quarter average of the ratio. Interestingly, this ratio reduces the econometric concern mentioned earlier regarding the predictor with a root that is local to unity. In contrary to dividend-price ratio, the null of unit root can be strongly rejected for this modified version of the dividend-price ratio. In addition, there is less correlation between predictor and excess return innovations when we estimate the regression equation with modified ratio compared to dividend-price ratio. Therefore, the modified predictor conveys some information that might improve the accuracy of the prediction of equity premium in out-of-sample performance due to some features such as less persistency, less correlation between predictor and return residuals, and being stationary.

This research attempts to use the modified predictor to address the controversial equity premium predictability across countries within non-linear framework. Regime shifts method is applied to address the issue of non-linearity between excess returns and earlier mentioned predictive variable. Our aim is to examine equity premium predictability across regimes and across countries by modified predictor that reduces econometric concerns regarding the size distortion bias that transmits forecast bias in predicting stock returns and potential error in return predictability null hypothesis to find out predictability pattern across the regimes. Specifically, we attempt to examine whether equity premium is predictable after accounting for Morkov Switching behavior.

Knowledge of the non-linearity between equity premium and the predictor has important application for investors' asset allocation decisions under a regime switching model. Transition probability and persistence of each regime provide some information for short-horizon investors to better time the market when they invest over specific regime. For example during the low return, high volatile and persistent regime, short-horizon investors attempt to time the market by reducing the allocation to the riskiest asset when investment opportunities are poor. In opposite, during the high return, low volatile and persistent regime, short-horizon investors attempt to time the market by increasing the allocation to the riskiest asset when investment opportunities are good.

In year 2008, the subprime crisis spilled over and became the catalyst for a much broader global financial crisis. In this research, considering the nature of contagion in financial markets, we analyze the role of financial crisis on transition probabilities of the Markov chain and the probability of the specific regime given information available up to current period. This provides investors insight about the persistency of the regimes and probability of the next regime in post-crisis period to make better investment decision and choose their trading strategies wisely.

We will examine the out-of-sample predictive power of the "dividend-price ratio over average" (dpa) to find out whether applying this modified ratio as a predictor in the framework of regime shifts is able to improve the predictability of the equity premium compared to historical average.

Overall, this research contributes to the literature in the following ways. First our sample consists of both developed and emerging countries with various volatility of the dividend-price ratio and different number of dividend paying firms within the indexes. As shown by Kellard et al. (2010), proportion of dividend paying firms in the index might affect degree of forecastability using dividend-price ratio as predictor. Second, this research studies the regime switching in equity market return in excess of the short interest rate using most recent data including the interesting periods of financial crisis 2008 and collapse of tech-bubble in early 2000s. Third, understanding the impact of financial crisis on the probability transition matrices across countries and knowledge of persistence of each regime has important implication for short-horizon investors. Fourth, we consider modified dividend-price ratio that captures deviation of actual price from the fundamental price in each period relative to the three-month moving sum of the ratio to examine whether equity premium is predictable after accounting for parameter instability in Markov switching framework. This predictor conveys features that reduce some econometric concerns in the literature about predictability of equity return using dividend-price ratio. The last contribution would be out-of-sample predictability performance of modified predictor in the context of the switching regression shed light on the real time performance of the predictor in forecasting equity premium.

Findings of this study will be relevant to economists, stock market analysts, portfolio managers and individual investors.

2. Literature Review

A large body of literature shows that stock market returns are predictable. Dividend-price ratio is among the most popular predictors of the stock returns and dividend growth. Many studies in the literature find the evidence in favor of the return predictability using dividend-price ratio. Among them, Cochrane (2008) applies joint distribution of dividend-price ratio coefficients in return and dividend growth regressions and shows that returns are predictable and not the dividend growth. Chen (2009) finds similar results for the period after World War II, returns are predictable by dividend-price ratio but dividend growths are not. The opposite predictability pattern characterizes the US stock market pre-1945 period.

Koijen and Nieuwerburgh (2011) survey the literature on return and dividend growth predictability. They find that predictability pattern of the stock returns and dividend growth is sensitive to the sample time period. They show that stock returns are less and dividend growth are more predictable over the full sample (1927-2009). However, when they consider the period post-World War II, these results reverse with no dividend growth and stronger return predictability, using simple predictability regressions with the dividend-price ratio as predictor. They also find return predictability is modest, but expected returns are persistent. As a result, about 90 per cent of the variation in price-dividend ratios is due to variation in expected returns.

Engsted and Pedersen (2010) use long term data of aggregate stock prices and dividends for US and three European countries including UK, Sweden and Denmark to analyze the dividend–price ratios ability to predict future stock returns and dividend growth. They apply VAR model similar to Cochrane (2008)'s methodology to analyze short and long horizon predictability of returns and dividend growth. Findings show that dividend-price ratio has predictive power for stock returns in countries like the UK and the US, and for dividend growth rates in others, such as Demark and Sweden. Their main contribution is to show that Predictability power of the dividend-price ratio is not similar across countries and predictability patterns in European stock markets are in many ways quite different from what characterize the US stock market.

Lettau and Ludvigson (2005) emphasize that expected returns are time-varying and make an important contribution to aggregate stock market fluctuations. Analysis of this paper demonstrates that dividend growth rates as well as stock returns have predictable component. They argue that dividend forecasts covary with changing forecasts of excess stock returns, and are positively correlated with business cycle variation in expected returns. Such fluctuations in expected returns and expected dividend growth have offsetting effects on the dividend–price ratio.

Binsbergen and Koijen (2010) argue that a latent factor that aggregates information contained in the history of price-dividend ratios and dividend growth rates is able to improve the prediction regression. They find that both expected returns and expected dividend growth rates are predictable, time-varying and persistent but expected returns are more persistent than expected dividend growth rates.

Park (2010) shows that predictability of the stock returns by dividend-price ratio differs over time and across countries. He argues that the unbalanced predictive regression can explain why dividend-price ratio is a good predictor in some period but it does not show predictive power in the other period. He shows that when both return and dividend-price ratio are I(0), dividend-price ratio has predictive power for stock returns.

Welch and Goyal (2008) reexamine the performance of long list of variables that have been suggested by the literature as good predictors of equity premium. They find that some periods such as Oil shock 1973-1975 have significant positive contribution to the performance of some models. They conduct recursive forecast method and examine the out-of-sample performance of the predictors in forecasting stock returns using mainly two out-of-sample statistics including difference "Root Mean Squared Error" (RMSE) of conditional and unconditional forecasts and "R-Squared" similar to Campbell and Thompson (2008) to examine the out-of-sample performance of each model compare to unconditional forecast. They find that most models seem unstable or even spurious as diagnosed by their poor out-of-sample predictions and predictability of a variety of popular economic and financial variables from the literature does not hold up in out of sample forecasting exercises.

Kellard et al. (2010) compare stock return predictability in the United States and United Kingdom on the basis of dividend-price ratios. They examine in-sample and out-of-sample return predictability for these two stock markets and find the evidence of in sample predictability for both markets although the findings are stronger for UK market. then in order to check if investors are able to time the market using dividend model they apply Goyal and Welch (2008) model to examine the out-of-sample predictability and compare the results with historical average to find out if the model is able to beat the unconditional model or historical average. They find that the dividend-price ratio exhibits stronger out-of-sample forecasting ability in terms of MSFE in the United Kingdom versus the United States, and they attribute the difference to the higher proportion of dividend-paying firms in the United Kingdom. Overall, the results in this paper indicate that the predictive ability of dividend ratios improves when an index with a higher fraction of dividend-paying companies is considered.

Henkel, Martin and Nardari (2011) capture the time-varying nature of return predictability in a regime switching context. They use a regime switching VAR with several predictors, including dividend yields, and interest rate variables along with equity premium for G7 countries during period from 1973 through 2007. They estimate their model via Bayesian methods and find the evidence of both in-sample and out-of-sample return predictability with predictability highly concentrated during recessions. Overall, their findings suggest that the historical average forecast is sufficient during "normal" times, while economic variables provide useful signals for forecasting returns during contractionary episodes.

Zhu and Zhu (2013) propose a Bayesian regime-switching combination (BRSC) approach to investigate the out-of-sample return forecastability and explore its macroeconomic links. In their empirical analysis, quarterly data for the period from 1947:1 through 2008:4 are used to meet the objective of the paper. In line with findings of the Henkel et al. (2011), they find two regimes are related to the business cycle. Based on the business cycle explanation of regimes, excess returns are found to be more predictable during economic contractions than during expansions.

Guidolin and Timmermann (2007) estimate a multivariate four-regime Markov-switching model for U.S. stock and bond returns via maximum likelihood, where the dividend yield serves as a predictor. They characterize the four states as "crash," "slow growth," "bull," and "recovery". They find that real-time asset allocation decisions guided by Markov-switching model forecasts of stock and bond returns yield substantial utility gains relative to asset allocation decisions based on constant expected excess return forecasts.

Dangl and Halling (2012) employ Bayesian methods in switching framework to forecast monthly U.S. equity premium over the period from May1937 through December 2002. They find that forecasts based on this approach significantly outperform the historical average, and in line with Henkel et al. (2011), they find predictability is closely related to the business cycle and the out-of-sample gains are concentrated during recessions.

Scaller and Norden (1997) apply two-state Markov process to examine the switching evidence in US equity market. The monthly stock market returns (including dividends) for the period of January 1929 through December 1989 are used. Their results imply a very strong rejection of the null hypothesis of no switching. This evidence is robust to a variety of different specifications: switching in means, switching in variances or switching in both means and variances. They use a multivariate specification for the Markov switching model which allows to examine whether the price-dividend ratio has marginal predictive power for stock market returns after accounting for state-dependent switching. Findings show the evidence of predictability in equity return. In a specification where switching is allowed in both means and variances, they find that the coefficient of the price-dividend ratio is about four times larger in the low-return state than in the high-return state. Overall they find strong evidence of switching in stock returns and predictability of stock market returns by dividend-price ratio.

3. Model and Methodology

Stock return predictability is typically examined via the following predictive regression model:

$$r_{t+1} = \alpha + \beta X_t + e_{t+1}$$

where r_{t+1} is the log return on a broad stock market index in excess of the risk-free interest rate (equity premium or excess stock return) from the end of period t to the end of period t +1. X_t is a variable available at the end of t used to predict the equity premium (such as the dividend-price ratio), and e_{t+1} is a zero-mean disturbance term.

Two econometric issues with predictive regression have been a recent focus of attention. First, in-sample tests of return predictability in the context of predictive regressions are complicated by the well-known Stambaugh (1986, 1999) bias. This bias arises when the predictor is highly persistent and the predictor and return innovations are correlated. Importantly, the Stambaugh bias potentially leads to substantial size distortions when testing the null hypothesis of no predictability, $\beta = 0$, using a conventional t-statistic approach. Second, for a predictor with unit root, the limit distribution of the t-test statistic is right skewed (Phillips, 2014). Hence, the null hypothesis of no predictability is often rejected when one uses critical values from a symmetric t-distribution even when the null hypothesis is correct. This explains oversizing in the standard t-test.

This research studies the non-linearity between equity premium and predictor using Markov switching frame work. This model characterizes the time series behaviors in different regimes. By permitting switching between the regimes, the model is able to capture more complex dynamic patterns. In the context of switching regression, maximum likelihood algorithm is used to estimate parameters. Chen and Deo (2009a) show that the likelihood ratio test (LRT) also suffers from oversizing mentioned earlier, because the LRT statistic is approximately the squared t-test under some regularity conditions.

To alleviate the econometric concerns in the literature regarding the non-stationary and persistent predictor, we modified the popular equity return predictor, dividend-price ratio, and serve it as predictor in Markov-switching model to forecast equity premium across regimes. Cornell (2013) shows that historical experience is important in the relationship of the dividend-price ratio and future equity returns. Therefore, modified predictor that has been introduced consists of dividend-price ratio in numerator and average of three-month of the ratio in the denominator ($^{dp_t}/_{\overline{dp}_{t,t-2}}$).This variable capture the shocks to the current period dividend-price ratio relative to average of a quarter of this valuation ratio. The null of unit root is strongly rejected for this variable in all considered countries in current research which is desirable in using Markov switching model. The autocorrelation coefficient of this variable is much smaller than dividend-price ratio and it shows much less variability compare to the dividend-price ratio as measured by its standard deviation. Given the advantages of using predictors with low variability, as argued by Campbell and Shiller (1988) and Fama and French (1988b), among others, we employ modified dividend-price ratio (dpa) as the predictive variable in our analysis to smooth out short-term noise.

In sum, advantages of using this variable as predictor are less persistency , lower standard deviation compare to dividend-price ratio, being stationary in level ,and lower correlation between the equity premium and dpa residuals compare to those of dividend-price ratio,dp. Therefore, the modified predictor conveys some information that might improve the accuracy of the prediction of equity premium in out-of-sample performance due to all above mentioned advantages relative to dividend-price ratio.

Following Henkel et al (2011), the analysis is based on one- month interval. Substantial evidence shows return predictability is consistent with a short-horizon phenomenon that is magnified at longer horizons (for examples, see Campbell, Lo, and McKinlay, 1997, p.271; Cochrane, 2001, p. 393). The choice of response variable whether nominal returns or excess returns should be selected, considering the findings by Engsted and Pederson (2010), we choose equity premium or total returns (including dividends) in excess of short-term interest rate in our analysis.

An approach for improving equity premium forecastability in the literature centers on regime shifts. The well-known Markov switching model has been widely used in the literature to capture the non-linearity between the stock returns and predictor. This model assumes that parameters take on different values as the economy switches between a relatively small numbers of latent states.

3.1. Basic Model

Suppose that the random variable of interest, equity premium (ep_t), follows a process that depends on the value of an unobserved discrete state variable s_t.We assume there are M possible regimes, and we are said to be in state or regime m in period t when $s_t = m$, for $m = (1, \dots, M)$.

The switching model assumes that there is a different regression model associated with each regime. To illustrate this, consider a simple two regime-switching model:

$$ep_t = \mu_t(m) + \sigma(m)\varepsilon_t \tag{1}$$

when $s_t = m$, where ε_t is iid standard normally distributed. Note that the standard deviation may be regime dependent $\sigma(m) = \sigma_m$.

3.2. Switching behavior in equity premium

To examine whether the Markov switching model is appropriate, we consider different specifications of switching in the data and find the switching pattern. Specifically, we examine whether there is evidence of regime switching in equity premium data series. Following the approach taken by Schaller and Norden (1997) and considering equation (1) for two regimes, there are three possible specifications of switching behavior. In the first specification, equity premium, ep_t is drawn from two distributions with different means (μ_1 and μ_2) :

$$ep_t = \mu_{1,t} + \mu_{2,t} + \sigma_1 \varepsilon_t \tag{2}$$

where ep_t is equity premium (total return including dividends minus short-term interest rate), μ_1 and μ_2 are mean equity premium in regime 1 and regime 2 respectively , ε_t is normally distributed regression error term, and σ_1 is the standard deviation of the regression residuals that is regime invariant in above equation.

In second alternative specification, equity premium is drawn from two distributions with the same mean but different variances (σ_1 and σ_2) :

$$ep_t = \mu_{1,t} + [\sigma_1 + \sigma_2]\varepsilon_t \tag{3}$$

The third specification allows for switching in both means and variances:

$$ep_t = \mu_{1,t} + \mu_{2,t} + [\sigma_1 + \sigma_2]\varepsilon_t \tag{4}$$

Under each of the alternative specifications, the distribution from which equity premium is drawn is determined by the state variable, s_t, explained in next section.

3.3. Modeling regimes: Markov switching model

In Markov switching model, switching mechanism is controlled by an unobservable state variable that follows a first order Markov chain. The transition matrix governs the random behavior of the sate variable. In this model, the Markovian state variable yields random and frequent changes of model structures and its transition probabilities determine the persistence of each regime.

The first-order Markov assumption requires that the probability of being in a regime depends on the previous state, the transition between states is governed by a $m \times m$ matrix with typical element,

$$p_{ij} = \Pr(S_t = j \,|S_{t-1} = i)(i, j = 1, \ldots, m)$$

For example in two regimes the transition probabilities are as next,

$$p_{11} = \Pr(S_t = 1\,|S_{t-1} = 1) \text{ and } p_{22} = \Pr(S_t = 2\,|S_{t-1} = 2) \tag{5}$$

$$p = \begin{bmatrix} p_{11} & p_{12} \\ p_{21} & p_{22} \end{bmatrix}$$

Clearly, the transition probabilities satisfy $p_{i1} + p_{i2} = 1$. The transition matrix determines the random behavior of the state variable, and it contains only two parameters, p_{11} and p_{22}.

This research aims to analyze the impact of financial crisis on transition probability matrix. To conduct the test, we split the sample into two sub-samples, one contain the period before the crisis and the other includes the period of financial crisis 2007-2008. The regime probability parameters are calculated for each regime over two sub-samples as well as full sample. The persistency of regimes and expected duration of the states will shed light on the effect of financial crisis on regime's probabilities.

3.4. Estimation techniques

Since the state of the economy is unobservable, equation (1) cannot be estimated using conventional regression techniques. Hamilton (1989) develops a non-linear iterative filter that can be used to estimate the parameters of Markov-switching models via maximum likelihood and make inferences regarding the state of the economy.

The likelihood contribution for a given observation may be formed by weighting the density function in each of the regimes by the one-step ahead probability of being in that regime:

$$L_t(\beta, \gamma, \sigma, \delta) = \sum_{m=1}^{M} \frac{1}{\sigma_m} \emptyset \left(\frac{ep_t - \mu_t(m)}{\sigma\,(m)}\right). P\,(s_t = m \vdots s_{t-1}, \delta)$$

$\beta = (\beta_1, \dots, \beta_M), = (\sigma_1, \dots, \sigma_M)$, δ are parameters that determine the regime probabilities, $\emptyset\,(.)$ is the standard normal density function, and s_{t-1} is the information set in period $t - 1$. In the simplest case, the δ represent the regime probabilities themselves.

The full log-likelihood is a normal mixture

$$l(\beta,\gamma,\sigma,\delta) = \sum_{t=1}^{T} log \sum_{m=1}^{M} \frac{1}{\sigma_m} \emptyset \left(\frac{ep_t - \mu_t(m)}{\sigma\,(m)}\right). P\,(s_t = m \,\vdots\, s_{t-1}\,,\delta)$$

which may be maximized with respect to$(\beta,\gamma,\sigma,\delta)$.

3.5. Equity premium predictability

This research is seeking to find the pattern of predictability of equity premium after controlling for switching using modified predictor, dpa. We estimate following regression equation that allows for switching in variances and predictability of mean equity premium.

$$ep_t = \mu_{1,t} + \beta_1 dpa_{t-1} + \mu_{2,t} + \beta_2 dpa_{t-1} + [\sigma_1 + \sigma_2]\varepsilon_t \quad (6)$$

where ep_t is equity premium (total return including dividends minus short-term interest rate), μ_1 and μ_2 are mean equity premium in regime 1 and regime 2 respectively, dpa_{t-1} is lagged "dividend-price ratio over average" , β_1 and β_2 are predictor coefficients across two regimes, ε_t is normally distributed regression error term, and σ_1 and σ_2 are the standard deviations of the regression residuals in regime 1 and 2 respectively.

Equation (6) allows for switching in both means and variances. This specification allows the effect of predictor on equity premium to be asymmetric.

3.6. Out-of-sample performance

The forecasting procedure follows Davidson (2004) in employing the one-step regime probabilities to compute the expected forecasted value. The out-of-sample R^2 statistic (R^2_{OOS}) is applied to evaluate the overall out-of-sample forecasting performance of the Markov switching forecasts using modified dividend-price ratio as predictor relative to the historical average benchmark.

Following Campbell and Thompson (2008), out-of-sample (OOS) prediction performance of "dividend-price ratio over average" for equity premium is examined as,

$$R^2_{OOS} = 1 - \frac{\sum_{t=1}^{T}(ep_t - \widehat{ep}_t)^2}{\sum_{t=1}^{T}(ep - \widetilde{ep}_t)^2} \quad (7)$$

where $\widehat{ep}_t$ is expected excess return or expected equity premium from the candidate model using data up to and including time $t-1$ and $\widetilde{ep}_t$ is the expected equity premium from the null model using data up to and including time $t-1$.

The R^2_{OOS} is the point estimate of the forecast accuracy. R^2_{OOS}> 0 indicates that the predictive regression forecast is more accurate than the historical average in terms of Mean Square Error (MSE) of the forecasts. Statistical significance of the results are evaluated using the MSE-F statistic proposed by McCracken (2007) which tests for the equality of the MSE of unconditional and conditional forecasts:

$$MSE - F = (T - n_0)\left(\frac{MSE_M - MSE_P}{MSE_P}\right) \tag{8}$$

The MSE-F statistic is a one-sided test for equal forecast accuracy. More specifically it is formulated under the null that the forecast error from the regression model is equal to or larger than that from the historical average regression. A rejection of the null hypothesis indicates that the regression model has superior forecast performance than the benchmark.

4. Data and variables

The Morgan Stanley Capital International (MSCI) equity indices in local currencies obtained from Bloomberg. Short-term interest rates are obtained from International Financial Statistics (IFS). All data are in monthly frequency to predict the monthly equity premium. The values are in local currencies to emphasize on domestic investor's perspective.[2] Our sample includes G7 and four Asian countries. It starts, when possible, in February 1995 and ends in October 2014.

- Equity Premium (ep_t) is the gross returns on broad equity market index minus the short-term interest rate. Following is used to calculate equity premium.

$$ep_t = r_t - t_{bill}$$

[2] Following Solnik(1993), Ang and Bekaert (2007), and Hjalmarsson (2010), among others, equity premium are measured in the national currency.

r_t is the gross equity index return at time t which is calculated as the logged changes in MSCI equity indices.

$$r_t = Ln\,({}^{MSCI_t}/_{MSCI_{t-1}})$$

t_{bill} is Treasury-bill rate , the secondary market rate of three-month treasury bills or money market rate if T-bill rate series is not available.

- Dividend–price ratio (dp_t).This variable is the log of a 12-month moving sum of dividends paid on the MSCI country's equity index minus log of stock price index. It is constructed by dividing "gross aggregate dividend yield" by 12 to find the monthly value of this variable. Bloomberg reports this value in percentage thus we convert it to decimal by dividing by 100. Then natural logarithm is taken for empirical purpose.

$$dp_t = Ln({}^{D_t}/_{P_t})$$

- Dividend-price ratio over average (dpa_t).This ratio is calculated by taking natural log of monthly dividend-price ratio minus natural log of last 3-month moving sum of dividend-price ratio including the current month.

$$dpa_t = Ln\,({}^{dp_t}/_{\overline{dp}_{t,t-2}})$$

4.1. Data Description

Table 1 presents summary statistics for equity premium, dividend-price ratio and modified dividend-price ratio for eleven markets including G7 (Panel A) and Asian (Panel B) countries. The first group consists of seven major advanced economies as reported by the International Monetary Fund: Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States and the second includes four major Asian markets: Hong Kong, Korea, Malaysia, and Singapore.

Table 1: summary statistics for monthly equity premium, dividend-price ratio, and modified dividend-price ratio.

Note: This table reports summary statistics of equity premium, dividend-price ratio, and modified dividend-price ratio for eleven countries including G7 developed markets (Panel A) and four Asian countries (Panel B). ***ep*** is monthly total return on the MSCI index of each country including gross dividends minus the short-term interest rate. dp is the natural log of monthly dividend-price ratio. dpa is the natural log of ratio of the dividend-price ratio over 3-month moving sum of dividend-price ratio. ADF-test column reports the p-values for the unit root Augmented Dickey Fuller tests. The null hypothesis is that there is a unit root in the series. AR(1) is first-order autocorrelation coefficient. Sample period is from February 1995 through October 2014.means and standard deviations of "ep" and standard deviations of dp and dpa are reported in percentage.

Country Name	***ep***		***dp***				***dpa***			
	Mean%	***Std%***	***Mean***	***Std%***	***ADF-test***	***AR(1)***	***Mean***	***Std%***	***ADF-test***	***AR(1)***
Panel A : G7 Countries										
Canada	0.56	4.5	-6.366	26.3	0.153	0.978	-0.001	4.2	0.000	0.506
France	0.45	5.3	-6.087	34.9	0.557	0.984	-0.001	4.9	0.000	0.488
Germany	0.47	6.3	-6.146	26.9	0.061	0.943	-0.002	7.0	0.000	0.450
Italy	0.09	6.2	-5.967	44.8	0.562	0.974	0.0004	7.7	0.000	0.480
Japan	0.08	5.3	-6.893	43.3	0.473	0.989	-2.195	4.9	0.000	0.510
UK	0.33	4.0	-5.801	21.5	0.409	0.980	0.0005	3.5	0.000	0.381
USA	0.56	4.5	-6.509	22.9	0.229	0.974	-0.002	3.5	0.000	0.449
Panel B : Asian Countries										
Hong Kong	0.55	7.3	-5.845	22.8	0.022	0.925	-0.002	6.9	0.000	0.516
Korea	0.17	8.7	-6.640	28.9	0.032	0.915	-0.005	9.0	0.000	0.359
Malaysia	0.29	7.2	-6.046	35.0	0.163	0.970	0.001	6.8	0.000	0.569
Singapore	0.36	6.6	-6.003	35.4	0.233	0.965	0.001	6.5	0.000	0.402

Table 1 compares dividend-price ratio and modified version of this ratio in terms of persistency and existence of unit root in the data. In this table ep is monthly equity premium or excess return. dp is the natural log of monthly dividend-price ratio. dpa is the natural log of ratio of the dividend-price ratio over 3-month moving average of dividend-price ratio. ADF-test column reports the p-values for the unit root augmented Dickey Fuller tests. The null hypothesis is that there is a unit root. $AR(1)$ is first-order autocorrelation coefficient which shows the persistency of the variable.

The mean equity premiums varies significantly across countries. U.S and Canada report the highest values among all countries. They show monthly mean equity premium of 0.56 per cent implying an annual mean of 6.72 per cent. They demonstrate the highest mean equity premiums across all considered countries while their standard deviations are relatively small compared to other G7 and Asian countries. Japan and Italy show the lowest mean of equity premium across all countries at 0.08 and 0.09 per cent per month respectively. The mean equity premium in Hong Kong is the highest among all Asian markets at 0.55% per month implying rate of 6.6% per annum.

The Standard deviations of the dividend-price ratios reported in Table 1 show that across all countries, this variable is highly volatile when compared, for example, to financial asset returns over the same time period. The range is between 21.5% to 44.8% for UK and Italy respectively. However, “dividend-price ratio over average” (dpa) is substantially less volatile with a monthly standard deviation range from 3.5% for UK and U.S to 7.7 % for Italy. Augmented Dickey Fuller tests strongly reject the null of unit root for “dividend-price ratio over average” but not for dividend-price ratio in all countries. The first order autocorrelation coefficients $(AR(1))$ for modified predictor are much smaller than those of dividend-price ratio for all considered counties. This implies that dividend-price ratio over average” (dpa) is less persistent compared to dividend-price ratio.

5. Empirical results

In this section we examine whether there is evidence of distinct regimes in equity premium in selected markets around the world. Specifically, different specifications of switching behavior in equity market premium have been analyzed. Then, we examine equity premium predictability by modified dividend-price ratio, "dividend-price ratio over average", and allow for asymmetric effect of the predictor on expected excess return to find the predictability pattern across two regimes. Next, the out-of-sample performance of this model will be discussed. We also consider the impact of financial crisis 2008 on the transition probability matrices in selected countries.

5.1. Univariate specifications of Markov regime switching

We consider three specifications of switching behavior in equity premium. In the first, equity premiums are drawn from two distinct distributions with different means (μ_1 and μ_2) as in equation (2). Second specification allows for heteroscedasticity in regimes while the mean in two states is common. This specification is based on equation (3) shown in section 3. The third alternative specification allows for both different means and variances between the regimes as shown in equation (4). This section aims to find out the switching behavior of excess return in terms of means and residual's standard deviations across two regimes.

Table 2 reports the results for different specifications of switching behavior in equity premium across G7 and four Asian markets. The first specification examines the switching behavior in mean equity premium for the entire sample period.

There is strong evidence of switching in means across all countries as proved by the reported p-values for tests of equality of the means across two regimes ($\mu_1 = \mu_2$) . This test rejects in all countries except Italy in the first specification when only switching in means is allowed between regimes. There is enormous differences in mean excess returns across two regimes in some countries. For example, monthly mean excess stock return for US in state 1 is 0.012, implying annual excess returns of about 14.4 per cent. When state 2 occurs, excess returns decrease by about 3.8 per cent in a single month.

Second specification allows for switching regression residuals' variances while the mean is non-switching. Tests of equality of the variances between two regimes under this specification strongly support the heteroscedacticity in the regimes across all selected countries. The estimates of the transition probabilities show that both low-volatility and high-volatility states are extremely persistent.

Third specification allows for switching in both means and variances across the regimes. The last two columns of Table 2 report the results for this specification. Across all countries Germany, UK, and US show strong evidence of switching in both means and variances over the regimes. Conditional on there being two regimes, most countries fail to reject the equality tests of

Table 2: Univariate specifications of Markov regime switching.

Note: This table reports parameter estimates from three univariate specifications of switching in equity premium. First, switching in mean excess return: $ep_t = \mu_1 + \mu_2 + \sigma(m)\varepsilon_t$; second, switching in residuals variances: $ep_t = \mu_1 + [\sigma_1 + \sigma_2]\varepsilon_t$ and third, switching in both means and variances: $ep_t = \mu_1 + \mu_2 + [\sigma_1 + \sigma_2]\varepsilon_t$. The mean equity excess return which is total returns (dividend plus capital gain) on the MSCI country index in excess of the short-term interest rate is μ_1 in regime 1 and μ_2 in regime 2. The log variances of residuals are denoted by σ_1 in regime 1 and σ_2 for regime 2. P_{11} and P_{22} are transition probabilities related to regime 1 and regime 2 respectively. Estimations are done by maximum likelihood. The sample period is from 1995:02 through 2014:10. * denote statistical significance at 10% level. Bold coefficients are statically significant at 1% or 5% significance levels.

Country Name	***Switching in means***		***Switching in variances***		***Switching in both means and variances***	
	Estimate	*Std. error*	*Estimate*	*Std. error*	*Estimate*	*Std. error*
Panel A : G7 Countries						
Canada						
μ_1	**0.010**	0.003	**0.009**	0.003	0.011	0.003
μ_2	**-0.124**	0.021			**-0.011**	0.013
σ_1	**-3.276**	0.050	**-3.461**	0.074	**-3.471**	0.003
σ_2			**-2.654**	0.137	**-2.664**	0.129
P_{11}	0.979		0.982		0.973	
P_{22}	0.441		0.945		0.915	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.098	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	
France						
μ_1	**0.017**	0.003	**0.009**	0.003	0.013	0.003
μ_2	**-0.087**	0.012			**-0.005**	0.010
σ_1	**-3.201**	0.057	**-3.491**	0.085	**-3.454**	0.115
σ_2			**-2.700**	0.080	**-2.677**	0.108
P_{11}	0.934		0.972		0.961	
P_{22}	0.517		0.970		0.950	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.088	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	

Table 2 - Continued.

Country Name	*Switching in means*		*Switching in variances*		*Switching in both means and variances*	
	Estimate	*Std. error*	*Estimate*	*Std. error*	*Estimate*	*Std. error*
Germany						
μ_1	**0.016**	0.004	**0.012**	0.003	**0.015**	0.003
μ_2	**-0.139**	0.018			-0.007	0.009
σ_1	**-3.026**	0.054	**-3.422**	0.087	**-3.416**	0.093
σ_2			**-2.467**	0.076	**-2.484**	0.077
P_{11}	0.946		0.966		0.964	
P_{22}	0.304		0.961		0.957	
	P-value		P-value		P-value	
$Test\ \mu_1 = \mu_2$	0.000		--		0.022	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	
Italy						
μ_1	0.002	0.008	0.006*	0.003	0.010	0.004
μ_2	0.000	0.003			**-0.002**	0.005
σ_1	**-2.784**	0.046	**-3.589**	0.098	**-3.601**	0.100
σ_2			**-2.658**	0.057	**-2.667**	0.057
P_{11}	0.567		0.972		0.971	
P_{22}	0.444		0.990		0.990	
	P-value		P-value		P-value	
$Test\ \mu_1 = \mu_2$	0.788		--		0.055	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	

Table 2 - Continued.

Country Name	*Switching in means*		*Switching in variances*		*Switching in both means and variances*	
	Estimate	*Std. error*	*Estimate*	*Std. error*	*Estimate*	*Std. error*
Japan						
μ_1	0.002	0.003	0.002	0.003	0.003	0.003
μ_2	**-0.180**	0.042			-0.165	0.127
σ_1	-3.000	0.047	**-3.002**	0.049	**-3.002**	0.049
σ_2			**-1.966**	0.488	**-2.748**	1.201
P_{11}	0.995		0.990		0.994	
P_{22}	0.440		0.490		0.448	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.190	
Test $\sigma_1 = \sigma_2$	--		0.033		0.834	
UK						
μ_1	**0.012**	0.002	**0.008**	0.002	**0.011**	0.002
μ_2	**-0.077**	0.010			-0.002	0.004
σ_1	**-3.503**	0.058	**-3.817**	0.114	**-3.845**	0.132
σ_2			**-2.996**	0.074	**-3.015**	0.072
P_{11}	0.922		0.970		0.965	
P_{22}	0.275		0.971		0.968	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.011	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	

Table 2 - Continued.

Country Name	*Switching in means*		*Switching in variances*		*Switching in both means and variances*	
	Estimate	*Std. error*	*Estimate*	*Std. error*	*Estimate*	*Std. error*
USA						
μ_1	**0.012**	0.005	**-0.023**	0.003	**0.013**	0.004
μ_2	**-0.038**	0.004			**-0.038**	0.004
σ_1	**-3.165**	0.047	**-3.824**	0.123	**-3.305**	0.082
σ_2			**-2.895**	0.055	**-3.093**	0.062
P_{11}	0.982		0.989		0.980	
P_{22}	0.987		0.974		0.986	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.000	
Test $\sigma_1 = \sigma_2$	--		0.000		0.044	
Panel B : Asian Countries						
Hong Kong						
μ_1	**0.009**	0.004	**0.011**	0.004	**0.014**	0.004
μ_2	**-0.241**	0.048			-0.007	0.011
σ_1	**-2.726**	0.049	**-3.126**	0.079	**-3.124**	0.082
σ_2			**-2.291**	0.085	**-2.311**	0.085
P_{11}	0.988		0.969		0.971	
P_{22}	0.264		0.954		0.956	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.090	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	

Table 2 - Continued.

Country Name	***Switching in means***		***Switching in variances***		***Switching in both means and variances***	
	Estimate	*Std. error*	*Estimate*	*Std. error*	*Estimate*	*Std. error*
Korea						
μ_1	**0.209**	0.045	0.003	0.005	0.003	0.005
μ_2	-0.007	0.006			-0.001	0.012
σ_1	**-2.566**	0.055	**-2.880**	0.082	**-2.883**	0.083
σ_2			**-2.019**	0.113	**-2.023**	0.114
P_{11}	0.343		0.988		0.987	
P_{22}	0.974		0.966		0.966	
	P-value		P-value		P-value	
$Test\ \mu_1 = \mu_2$	0.000		--		0.753	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	
Malaysia						
μ_1	**0.010**	0.004	**0.009**	0.003	**0.010**	0.003
μ_2	**-0.191**	0.026			-0.016	0.016
σ_1	**-2.797**	0.049	**-3.270**	0.070	**-3.274**	0.068
σ_2			**-2.094**	0.100	**-2.117**	0.098
P_{11}	0.985		0.986		0.986	
P_{22}	0.604		0.961		0.962	
	P-value		P-value		P-value	
$Test\ \mu_1 = \mu_2$	0.000		--		0.110	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	

Table 2 - Continued.

Country Name	*Switching in means*		*Switching in variances*		*Switching in both means and variances*	
	Estimate	*Std. error*	*Estimate*	*Std. error*	*Estimate*	*Std. error*
Singapore						
μ_1	**0.013**	0.004	**0.008**	0.003	**0.010**	0.003
μ_2	**-0.171**	0.021			-0.006	0.010
σ_1	**-2.946**	0.053	**-3.317**	0.092	**-3.341**	0.088
σ_2			**-2.328**	0.089	**-2.353**	0.087
P_{11}	0.956		0.975		0.973	
P_{22}	0.161		0.952		0.951	
	P-value		P-value		P-value	
Test $\mu_1 = \mu_2$	0.000		--		0.131	
Test $\sigma_1 = \sigma_2$	--		0.000		0.000	

the regime-dependent means ($\mu_1 = \mu_2$), however, with the exception of Japan, overwhelmingly reject that $\sigma_1 = \sigma_2$. These findings are in line with Ang and Timmerman(2012) where they could not reject $\mu_1 = \mu_2$ at 5% conventional level of significance but significantly reject the $\sigma_1 = \sigma_2$. They attributes the findings of non-switching in means to the difficulties associated with estimation of means of returns. They mentioned that "estimating means of returns is difficult even in a setting without regimes, as the unconditional mean is best pinned down by long time series (see Merton 1980). Thus, it is not surprising that the means conditional on each regime are harder to identify, as the number of observations of each regime must necessarily be less than the total number of observations in the sample." They pointed out studies based on longer samples, multiple assets, and/or states have shown sufficient power to reject that mean returns are identical across regimes (e.g., Guidolin & Timmermann 2006).

Despite means being hard to be identified, there are some natural economic properties of the mean estimators. For equity premium returns, there is a high-volatility regime that has, on average, low returns. This pattern has been observed since the earliest studies of regime switching on equity returns, such as Turner, Startz & Nelson (1989) and Hamilton & Susmel (1994). It may at first seem puzzling that the high-volatility regime has the lowest expected return but Ang and Timmerman (2012) show that equilibrium asset pricing models are consistent with a negative risk-return trade-off in some regimes. Further, these are not ex ante expected returns and ex ante volatility estimates, given that they do not account for the probability of switching across regimes or learning in real time about the regime. High conditional return volatility can be induced by high levels of uncertainty about future states.

The coefficients for means and variances are statistically significant in most countries. The estimates of the transition probabilities in third specification when both means and variances are allowed to switch between the regimes are very similar to the second specification that there is only switching in variances. The probabilities of the regimes reported in the table demonstrate the large probability values indicating the high persistency of the regimes. Table 2 shows that both states are highly persistent with higher persistency of the good state or high-return and low-volatility regime. Equity markets are often described in terms of volatility. In the simplest terms we could say that the market goes through periods of low volatility with relatively shorter periods of high volatility.

Overall, the results indicate that the equity market in most countries is characterized by two distinct regimes. A state in which risk is relatively low and investor earn more than or same as they would earn holding the treasury bills or short-term low risk bonds and a state in which risk is higher and investors earn less than they would earn by investing in low-risk investment.

5.2. Equity premium predictability

In this section we examine the predictive power of the "dividend-price ratio over average", dpa for equity premium across eleven countries around the world. As discussed in section 3, the modified ratio alleviates some econometric concerns in the literature related to dividend-price ratio as predictor. We attempt to analyze equity premium predictability in the framework of Markov switching using modified predictor that is similar to dividend yield with substantial feature in reducing the size distortion biased documented in the literature considering dividend-price ratio as predictor.

Table 3 represents the country-by-country results of the predictability of equity premium using modified predictor (dpa). We estimate the equation (6) and allow the asymmetric effect of the predictor on expected equity premium. The empirical estimates provide evidence of predictability in 6 out of 11 countries. The predictability has been documented in Japan, UK, US, and Singapore in regime 1 which is the regime with high return and low volatility in general. Canada, Japan, and Malaysia demonstrate predictability in regime 2, high volatile and low return regime. Japan shows the strongest evidence of predictability of equity premium by dividend-price ratio over average (dpa) across both regimes. The equality tests of the estimated coefficients between two regimes can be rejected in 4 out of 11 countries including Canada, Japan, UK, and Singapore (not reported).

5.3. Out-of-sample forecasting performance

We follow the procedure taken by Davidson (2004) in employing the one-step regime probabilities to compute the expected forecasted values. The forecasting window is from January 2010 towards the end of sample period. The forecasting exercise occurs recursively on an expanding window. For instance, the Markov switching model is first estimated over the 1995:02–2009:12 interval and forecast for 2010:01will be made. Next, the model is re-estimated over the 1995:02 through 2010:01 and a forecast is generated for 2010:02, and so forth.

Table 3: In-sample equity premium predictability.

Note: This table allows excess returns to be influenced by log (price-dividend ratio/ 3-month moving average of dividend-price ratio), dpa. The following equation is used to predict equity premium: $ep_t = \mu_1 + \mu_2 + \beta_1 dpa_{t-1} + \beta_2 dpa_{t-1} + [\sigma_1 + \sigma_2]\varepsilon_t$. The mean equity excess return which is total returns (dividend plus capital gain) on the MSCI country index in excess of the short-term interest rate is μ_1 in regime 1 and μ_2 in regime 2. The logged variance of residuals is denoted by σ_1 in regime 1 and σ_2 for regime 2. P_{11} and P_{22} are transition probabilities related to regime 1 and regime 2 respectively. Estimations are done by maximum likelihood. The sample period is from February 1995 through October 2014. * denote statistical significance at 10%level. Bold coefficients are statically significant at 1% or 5% significance levels.

Country Name	*dpa*		*Country Name*	*dpa*	
	Estimate	*Std. error*		*Estimate*	*Std. error*
Panel A : G7 countries					
Canada			**France**		
μ_1	**0.012**	0.003	μ_1	**0.013**	0.004
β_1	0.105	0.093	β_1	0.016	0.143
μ_2	-0.009	0.010	μ_2	-0.005	0.010
β_2	-0.288*	0.155	β_2	-0.161	0.121
σ_1	**-3.489**	0.074	σ_1	**-3.441**	0.130
σ_2	**-2.699**	0.114	σ_2	**-2.686**	0.117
P_{11}	0.962		P_{11}	0.958	
P_{22}	0.888		P_{22}	0.947	
Germany			**Italy**		
μ_1	**0.016**	0.003	μ_1	**0.010**	0.004
β_1	0.051	0.074	β_1	0.014	0.061
μ_2	-0.007	0.009	μ_2	-0.002	0.005
β_2	-0.003	0.016	β_2	-0.039	0.065
σ_1	**-3.435**	0.085	σ_1	**-3.601**	0.100
σ_2	**-2.484**	0.075	σ_2	**-2.663**	0.058
P_{11}	0.972		P_{11}	0.970	
P_{22}	0.962		P_{22}	0.989	

Table 3: Continued.

Country Name	*dpa*		*Country Name*	*dpa*	
	Estimate	*Std. error*		*Estimate*	*Std. error*
Japan			**UK**		
μ_1	**-0.363**	0.150	μ_1	**0.010**	0.002
β_1	**-0.167**	0.068	β_1	0.202*	0.105
μ_2	**-2.375**	0.005	μ_2	-0.003	0.005
β_2	**-1.032**	0.002	β_2	-0.060	0.104
σ_1	**-3.008**	0.047	σ_1	**-3.821**	0.101
σ_2	**-7.336**	1.143	σ_2	**-3.005**	0.071
P_{11}	0.996		P_{11}	0.970	
P_{22}	0.561		P_{22}	0.969	
USA					
μ_1	**0.025**	0.005			
β_1	**0.309**	0.120			
μ_2	**-0.038**	0.004			
β_2	0.124	0.121			
σ_1	**-3.547**	0.112			
σ_2	**-3.112**	0.062			
P_{11}	0.920				
P_{22}	0.960				

Table 3: Continued.

Country Name	***dpa***		***Country Name***	***dpa***	
	Estimate	***Std. error***		***Estimate***	***Std. error***
Panel B: Asian countries					
Hong Kong			**Korea**		
μ_1	**0.014**	0.004	μ_1	0.003	0.005
β_1	0.117	0.100	β_1	-0.025	0.083
μ_2	-0.008	0.011	μ_2	-0.002	0.020
β_2	-0.060	0.113	β_2	-0.074	0.124
σ_1	**-3.135**	0.081	σ_1	**-2.871**	0.082
σ_2	**-2.310**	0.089	σ_2	**-2.017**	0.116
P_{11}	0.972		P_{11}	0.988	
P_{22}	0.953		P_{22}	0.965	
Malaysia			**Singapore**		
μ_1	**0.010**	0.003	μ_1	**0.011**	0.003
β_1	-0.013	0.075	β_1	0.141*	0.074
μ_2	-0.015	0.015	μ_2	-0.006	0.010
β_2	-0.257*	0.142	β_2	-0.109	0.114
σ_1	**-3.289**	0.065	σ_1	**-3.369**	0.074
σ_2	**-2.144**	0.098	σ_2	**-2.365**	0.086
P_{11}	0.988		P_{11}	0.969	
P_{22}	0.962		P_{22}	0.947	

The out-of-sample performance of the model has been examined following Campbell and Thompson (2008). We attempt to find out whether the model can be as effective out-of-sample as the historical average benchmark.

Table 4 represents out-of-sample performance of log (dividend-price ratio/3-month moving sum of price-dividend ratio) for equity premium -1 month ahead from January 2010 to October 2014 in the context of Markov switching methodology. The table reports the out-of-sample R-squared (OOS-R^2) in percentage points. OOS-R^2 provides the percentage by which the regression model beats the historical average benchmark. Statistical inference is based on McCracken's (2007) MSE-F test, which assesses whether the forecast error from the regression model is smaller than the forecast error from the historical average regression. Critical values are based on a bootstrap procedure under the null hypothesis of equal forecast accuracy.

Table 4 reports the outperformance of the model compared to historical average benchmark for two countries of Japan and Malaysia with 2.6% and 0.32% OOS-R^2 respectively. The reported OOS-R^2 for most countries are negative, ranging from -1.074 to -13.42. Although, 6 out of 11 countries considered in this research show the evidence of excess return predictability in-sample using modified predictor in regime switching framework, the model performs well in two markets out-of-sample.

5.4. The effect of financial crisis on transition probabilities

To find the effect of financial crisis on transition probabilities we split up entire sample into two sub-samples. First sub-sample includes the period before financial crisis from 1995:02 to 2007:07 and second sub-sample includes financial crisis of post-2007. The regimes are characterized by volatility. Regime 1 denotes the regime with low volatility and Regime 2 with high volatility.

Table 5 compares the regime probabilities considering full sample period from February 1995 through October 2014 and two sub-periods before and after crisis 2007. We consider the start point of crisis in August 2007 and split the sample based on this date. The table shows the persistence of Low and High volatility regimes. P_{11} denotes the probability of remaining in regime 1 next period while the current period is regime1. Similarly, P_{22} indicates the probability of persisting in regime 2 next period while the current period is regime 2.

Table 4: Out-of-sample equity premium predictability.

Note: This table represents out-of-sample performance log (dividend-price ratio/3-month moving sum of dividend-price ratio), *dpa,* as predictor of equity premium -1 month ahead from January 2010 to October 2014 in the context of Markov switching methodology. The table reports the out-of-sample R-squared (OOS-R^2) in percentage points. OOS-R^2 provides the percentage by which the regression model beats the historical average benchmark. Statistical inference is based on McCracken's (2007) MSE-F test, which assesses if the forecast error from the regression model is smaller than the forecast error from the historical average regression. Critical values are based on a bootstrap procedure under the null hypothesis of equal forecast accuracy. RMSE denotes the root mean square error of the forecasts and MSE is the mean square error of the forecasts, both reported in percentage. ***, ** and * denote statistical significance at the 1%, 5%, and 10% levels respectively.

Country Name	***Historical Average***		***dpa***		
	RMSE	***MSE***	***RMSE***	***MSE***	***OOS-R^2***
Panel A : G7 countries					
Canada	3.007	0.090	3.203	0.103	-13.42
France	4.260	0.181	4.313	0.186	-2.51
Germany	4.813	0.232	4.963	0.246	-6.35
Italy	6.125	0.375	6.150	0.378	-0.81
Japan	5.299	0.281	5.229	0.273	2.61***
UK	3.570	0.127	3.796	0.144	-13.06
USA	5.472	0.299	5.506	0.303	-1.26
Panel B : Asian countries					
Hong Kong	5.326	0.284	5.521	0.305	-7.429
Korea	4.349	0.189	4.372	0.191	-1.074
Malaysia	2.730	0.075	2.726	0.074	0.315*
Singapore	3.924	0.154	4.081	0.167	-8.156

P_{11}= Prob ($s_t = Low\ volatility\ state \vdots s_{t-1} = Low\ volatility\ state$)

P_{22}=Prob ($s_t = High\ volatility\ state \vdots s_{t-1} = High\ volatility\ state$)

The results for the full sample period show that, although the regime transition probabilities vary across countries, the regimes are highly persistent in all considered countries. With the exception of Italy the probability of going from good (low volatility) regime to another good regime denoted by P_{11} is higher than the probability of going from bad (high volatility) regime to another bad regime.

The more persistent the regimes, the less would be the risk and uncertainty perceived by investors. The possibility of switching across regimes, even if it occurs relatively rarely, induces an important additional source of uncertainty. Table 5 reports the probabilities of the regimes 1 and 2 before financial crisis in column 4 and 5. The results for post-crisis 2007 transition probabilities are reported in column 6 and 7. The persistency of the regimes is lower post crisis-2007 period in almost all countries. More transition between the regimes indicates higher risk involved in the market and higher uncertainty perceived by investors since the states are not observable. Overall, the findings show the adverse effect of financial crisis on regime's transition probabilities by increasing the probability of switching between regimes post-crisis implying higher risk perceived by investors as a result of higher uncertainty inherent in regime transitions.

Table 5: The effect of financial crisis 2007 on transition probabilities.

Note: This table compares the regimes probabilities considering full sample period from 1995:02 through 2014:10 and two sub-periods before and after crisis 2007-2008. We consider the start point of crisis in August 2007 and split the sample based on this date. The table shows the persistence of Low and High volatility regimes. P_{11} denotes the probability of remaining in regime 1 next period while the current period is regime1. similarly, P_{22} indicates the probability of remaining in regime 2 next period while the current period is regime 2. P_{11}= Prob ($s_t = Low\ volatility\ state \vdots s_{t-1} = Low\ volatility\ state$) and P_{22}= Prob ($s_t = High\ volatility\ state \vdots s_{t-1} = High\ volatility\ state$).

Country Name	***Full sample***		***1995M02-2007M07***		***2007M08-2014M10***	
	P11	***P22***	***P11***	***P22***	***P11***	***P22***
Panel A : G7 countries						
Canada	0.98	0.95	0.99	0.97	0.98	0.90
France	0.97	0.97	0.98	0.97	0.37	0.98
Germany	0.97	0.96	0.98	0.98	0.96	0.90
Italy	0.97	0.99	0.99	0.99	0.00	0.98
Japan	0.99	0.49	0.00	0.98	0.97	0.48
UK	0.97	0.97	0.99	0.98	0.01	0.98
USA	0.99	0.97	0.98	0.98	0.93	0.91
Panel B : Asian countries						
Hong Kong	0.97	0.95	0.99	0.97	0.95	0.93
Korea	0.99	0.97	0.99	0.98	0.70	0.00
Malaysia	0.99	0.96	0.99	0.98	0.94	0.89
Singapore	0.98	0.95	0.99	0.98	0.94	0.75

1. Concluding Remarks

This research attempts to find predictability of the equity premium across G7 and four major Asian markets within a non-linear framework. The predictability of equity premium has been analyzed in the context of Markov switching model that allows the parameters get different values across two regimes. To find the switching behavior in equity premium for selected countries, three switching specifications are considered. We find strong evidence of switching behavior in equity premium for most considered countries. This evidence is robust to a variety of different specifications consists of switching in means, switching in variances and switching in both means and variances. The modified version of the dividend-price ratio that has been used in this research as predictor shows features that alleviate some econometric concerns in the literature regarding the size distortion bias using predictor such as dividend-price ratio which is highly persistent and not stationary. Another issue is high correlation between the equity premium and dividend-price ratio innovations that would be problematic when we estimate the model. In-sample analysis documents the evidence of predictability for equity premium using modified predictor, "dividend-price ratio over average",dpa, in 6 out of 11 markets. The evidence of predictability has found in Japan, UK, US, and Singapore in regime 1, regime with low volatility and relatively higher expected excess return, while there is predictability of equity premium in Canada, Japan, and Malaysia over regime 2, regime with higher volatility and lower expected equity premium. The out-of-sample forecastability performance of the model shows superior performance of forecasts made by the model in two countries of Japan and Malaysia compared to historical average benchmark as shown by positive and significant out-of-sample R^2 . Transition probability analysis before and after financial crisis 2007-2008 shows that although the regimes are highly persistent over the full sample period and during the pre-crisis period in most countries, there is less evidence of persistency in post-crisis 2007. The probability of persisting in the current regime for one more period is lower for all countries post-crisis 2007 compare to pre-crisis period. This finding indicates the higher risk perceived by investor as a result of higher probability of switching between regimes.

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APPENDICES

Appendix A

This appendix shows the data along with the Bloomberg tickers used to construct the considered variables in chapter 1.

Return (r): this variable is constructed using RT116: Total return index (Gross Dividends). The Bloomberg name for this series is TOT_RETURN_INDEX_GROSS_DVDS.

The stock return country index codes are:

MXAU,MXAT,MXCA,MXDK,MXFI,MXFR,MXDE,MXHK,MXIT,MXJP,MXNL,MX ,NO,MXPT,MXSG,MXSE,MXCH,MXGB,MXUS,MXBR,MXCL,MXCN,MXCO,MXHU,MXI N,MXID,MXKR,MXMY,MXMX,MXPE,MXPH,MXPL,MXRU,MXZA,TAMSCI,MXTH,MX TR

Dividend–price ratio (dp).This variable is constructed as IN075: Gross Aggregate Dividend Yield which is Computed as the Gross Dividend per Share Aggregate 12 Month (IN073, GROSS_DPS_12M_AGGTE) divided by the current security Last Price (PR005, PX_LAST).

Dividend–yield ratio (dy).This is the sum of dividends paid over the last 12 months on firms in the equity index (IN073: GROSS_DPS_12M_AGGTE) divided by the previous month's stock index price (PR005: PX_LAST).We divide IN073by 12 to get monthly dividend yield.

Growth in earnings (ge).To construct this variable we use IN071: EPS Before XO Aggregate which is computed by aggregate earnings of the index, calculated by summing up the Trailing 12M EPS before XO Items (RR819, TRAIL_12M_EPS_BEF_XO_ITEM) of the member companies times the shares in the index for each member and dividing it by the index divisor.

Growth in price-earnings ratio (gm)**.**To construct this variable we use IN004: Adjusted Price/Earnings ratio which is computed by The Price to Earnings ratio for an equity index is calculated as Last Price (PR005, PX_LAST) divided by the Trailing 12M EPS Aggregate (IN001, T12_EPS_AGGTE). The index earnings are calculated by summing up for each equity the shares in the index multiplied by the Trailing 12 month earnings per share. Earnings used are Before XO Items (RR819, TRAIL_12M_EPS_BEF_XO_ITEM).

Payout ratio. Fraction of net income a firm pays to its shareholders in dividends, in percentage. Calculated as:

Total Common Dividends*100 / Income before Extraordinary Items Less Minority and Preferred Dividend

where:

Total Cash Common Dividend is IS052, IS_TOT_CASH_COM_DVD

Income Before Extraordinary Items Less Minority and Preferred Dvd is RR092, INC_BEF_XO_LESS_MIN_INT_PREF_DVD

Price to Book Ratio. Ratio of the stock price to the index book value. Calculated as:

Price to Book Ratio = Last Price / Book Value

where,

Last Price is PR005, PX_LAST and Book Value Per Share is RR020, BOOK_VAL_TOT

Data from the most recent reporting period (quarterly, semi-annual or annual) used in the calculation.

Return on Equity (ROE). Measure of a corporation's profitability by revealing how much profit a company generates with the money shareholders have invested, in percentage. Calculated as:

(T12 Net Income Available for Common Shareholders / Average Total Common Equity) * 100

where,

T12 Net Income Available for Common Shareholders is T0089, TRAIL_12M_NET_INC_AVAI_COM_SHARE. Average Total Common Equity is the average of the beginning balance and ending balance of RR010, TOT_COMMON_EQY

Price/EBITDA Ratio. Calculated as Last Price (PR005, PX_LAST) divided by Trailing 12M EBITDA Per Share (RR009, EBITDA). Trailing 12-month EBITDA per basic share, calculated as the sum of EBITDA per basic for the most recent four quarters.

Index Market Capitalization. Index Last Price (PR005, PX_LAST) multiplied by the Index Divisor (IN018, INDX_DIVISOR). Index Market Cap represents the aggregate calculation of constituent market values used to determine the index value.

Appendix B

This section shows how we construct the equity premium and dividend-price ratio in chapter 2.

equity premium (ep_t): This variable is constructed using total equity return including dividends minus T-bill or money market rate (short interest rate) .

RT116: Total return index (including Gross Dividends). The Bloomberg name for this series is TOT_RETURN_INDEX_GROSS_DVDS.

The stock return country index codes are:

MXCA, MXFR, MXDE, MXHK, MXIT, MXJP, MXSG, MXGB, MXUS, MXKR, MXMY.

Dividend–price ratio (dp).This variable is constructed as IN075: Gross Aggregate Dividend Yield which is Computed as the Gross Dividend per Share Aggregate 12 Month (IN073, GROSS_DPS_12M_AGGTE) divided by the current security Last Price (PR005, PX_LAST).

VITA

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